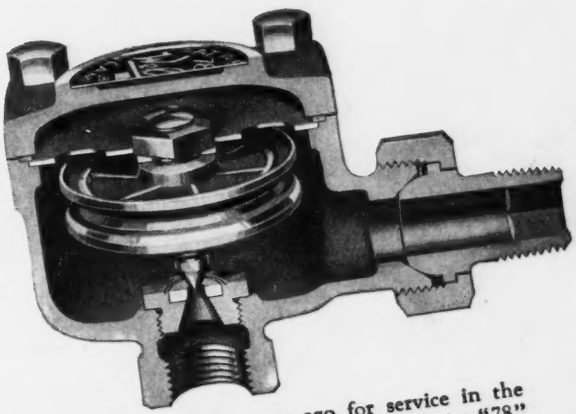
HEATING AND VENTILATING

SEPTEMBER 1929

Accepted-in every industry

Webster "78" Traps



INTRODUCED three years ago for service in the *process-steam pressure range, Webster Series "78" Traps have met with enthusiastic acceptance in every steam-using industry because of *performance*.

Thousands of "78's," in hundreds of different applications, have speeded heating-up, increased daily output, reduced processing costs. Only a few typical cases are illustrated here . . . proof of performance is everywhere. Engineers are recommending a *separate Series "78" Trap on each steam-using unit* instead of old-fashioned "master trap" arrangements. Heating contractors are developing attractive business in modernizing faulty and obsolete process steam installations with "78's."

Examine the cases illustrated here. Ask for additional information. Catalogue, engineering data manual, reports of specific installation results sent on request.

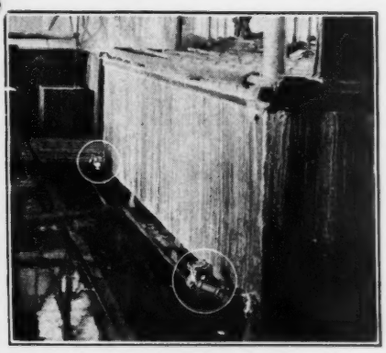
WARREN WEBSTER & COMPANY

Pioneers of the Vacuum System of Steam Heating

Branches in 52 Cities

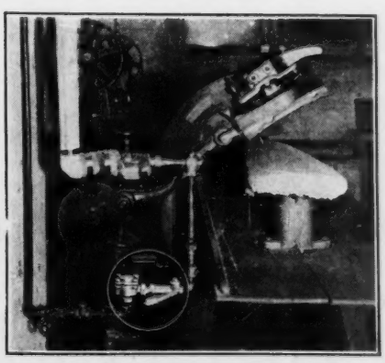
CAMDEN, N.J.

*"Process-Steam," i.e. steam at pressures from 10 to 100 lbs.

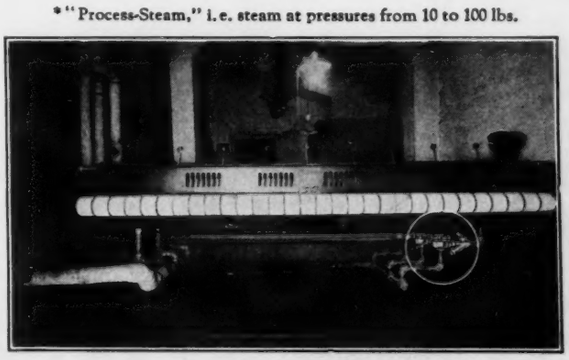


Tank heating in process work. Report 22, sent on request, tells how cleaning solution tank heated with coils and "78's" replaced direct gas flame, reduced insurance cost, eliminated spoilage of product and increased production.

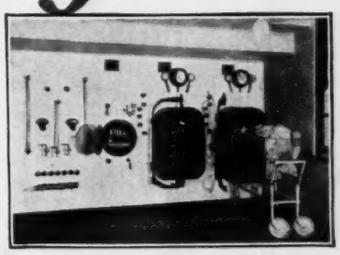
Report 17, sent on request, tells about a tannery vat installation where coils and "78's" working against a five foot lift are saving $720.00 per year over direct heating by steam injections.



Tailor's press—with "78's," quicker discharge of air and condensation mean quicker heating up and more work per machine.

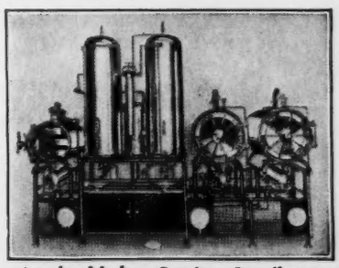


Flatwork Ironer—more than 20% increased output resulted from installing a *separate "78" Trap on each of the six rolls of this machine* in place of the old-fashioned method of one trap for all six. The owner saved the purchase price of an additional machine!

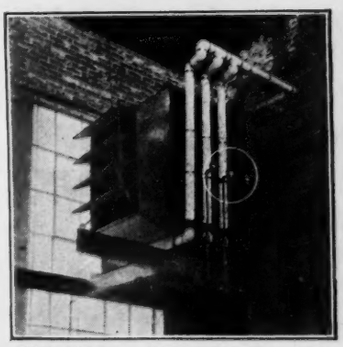


A Modern Sterilizer Installation

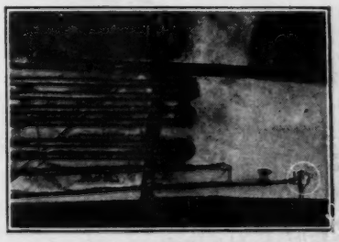
Leading sterilizer manufacturers standardized on "78's" after exhaustive tests proved *a separate "78" Trap on each unit far superior to older methods* of condensation and air removal. Modern sterilizer installations everywhere are now "78" Trap equipped. Inefficient and obsolete sterilizer installations are being modernized with "78's." Complete application data on request.



Another Modern Sterilizer Installation

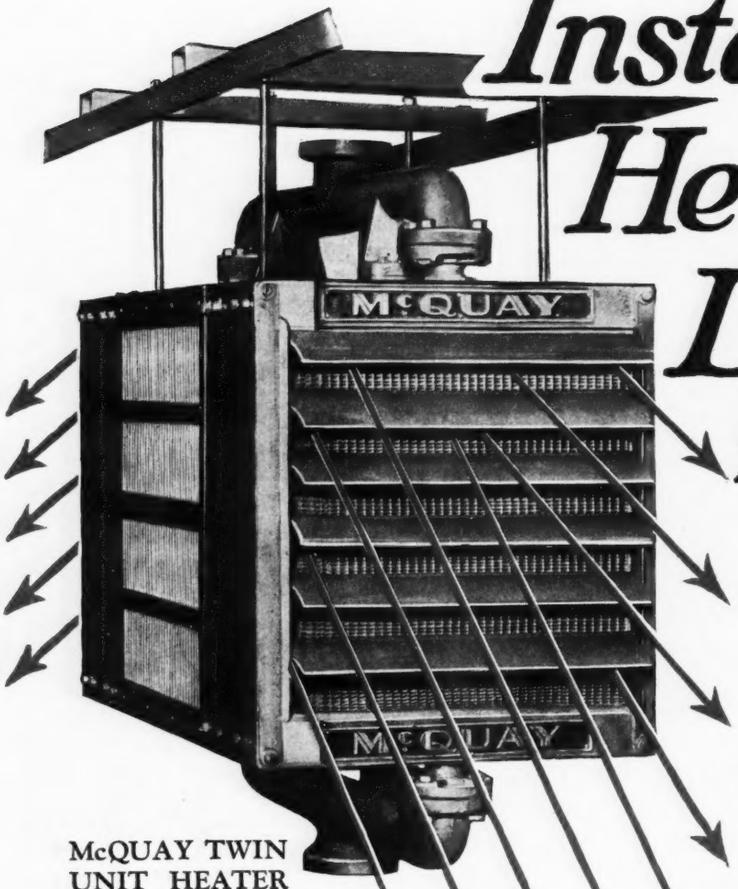


"High Pressure" Unit Heaters — both floor and suspended types, operate better with "78's" because of complete and continuous air removal.



Coils, whether for heating, in tanks, blast stacks or dryers are more efficient when equipped with "78's."

Instantaneous Heat in Both Directions from One McQuay



McQUAY TWIN UNIT HEATER

This one unit will warm a floor area of 6000 sq. ft., driving a continuous flow of heat 75 feet in *both* directions. It does the work of 4 tons of cast iron radiation.

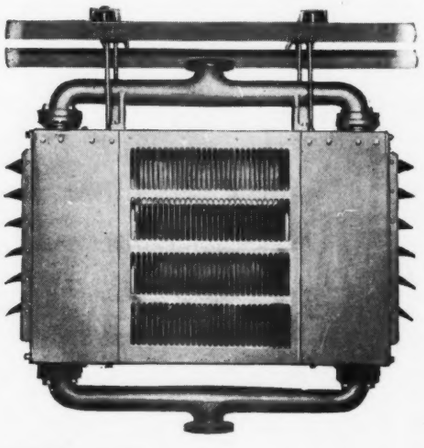
The tubes are seamless *copper*, swaged and brazed into a *copper* header—giving an equal expansion and contraction and eliminating possibility of leaks that occur when tubes and headers are of different materials. The specially designed flat tubes permit free passage of air.

Another McQuay achievement: A twin unit that pours heated air from both ends—and gets it down into the "working areas" *instantly*.

Heating with McQuay Units is the best and most economical way known for factories, stores, large offices, etc.

They cost less to install. And they cost less to operate because all the heat is *sent down*, and *kept down*, near the floor where it is needed.

Prices and Specifications from any Heating Engineer or Contractor.



McQUAY RADIATOR CORPORATION

General Offices: 35 East Wacker Drive, Chicago

[*Branches in principal cities*]

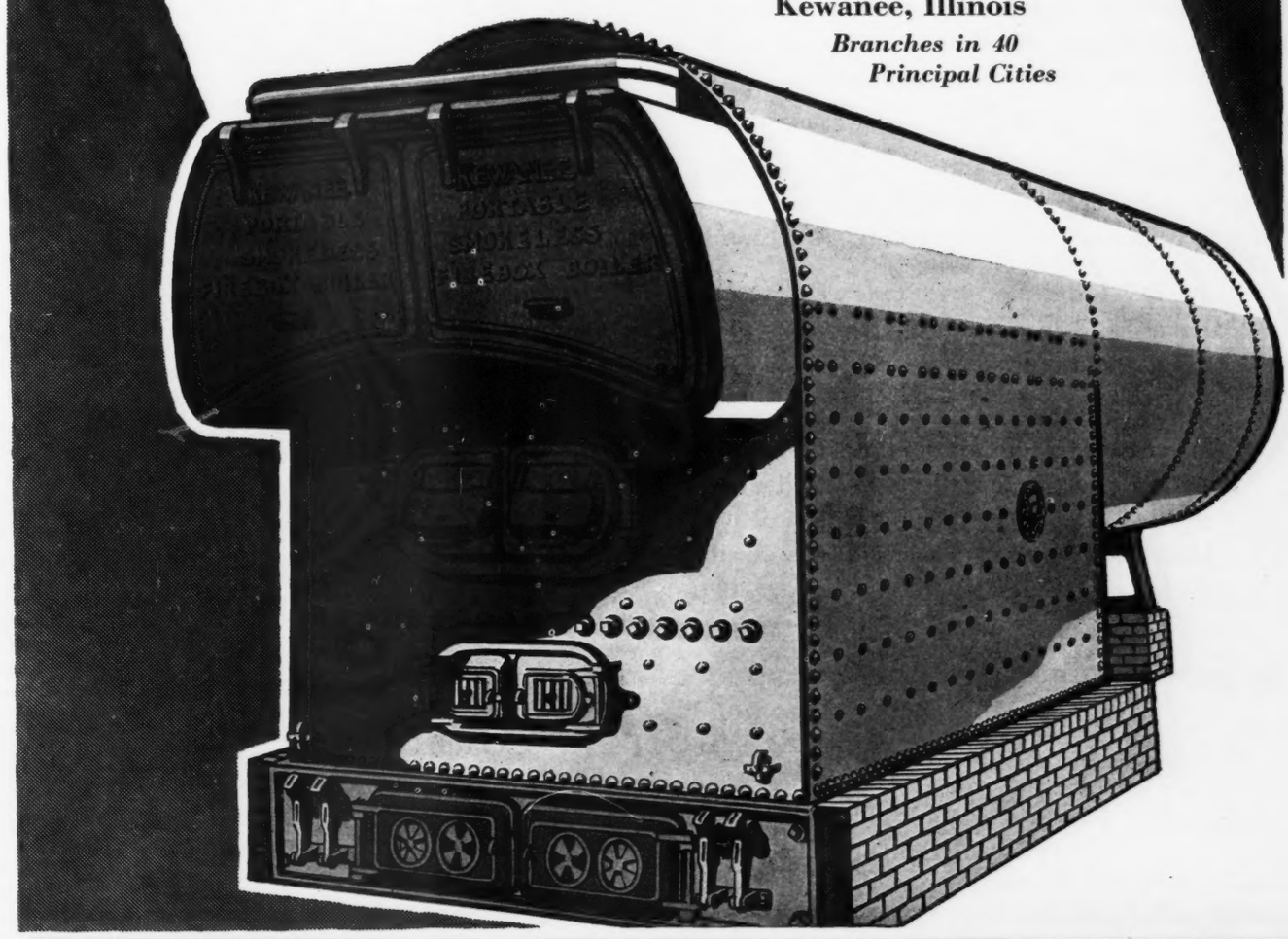
McQUAY TWIN UNIT HEATER

KEWANEE
STEEL RIVETED BOILERS

A boiler is bought *only once.* Its fuel must be bought *every year.* So, a low yearly fuel cost is far more important than the original price paid for the boiler.

Kewanee makes no claims for "Bargain Basement" price. But it does claim—and these claims are backed by performance in the finest buildings—that in the long run Kewanee is the *best boiler investment any owner can make.*

KEWANEE BOILER CORPORATION
division of American Radiator and Standard Sanitary Corporation
Kewanee, Illinois
Branches in 40 Principal Cities



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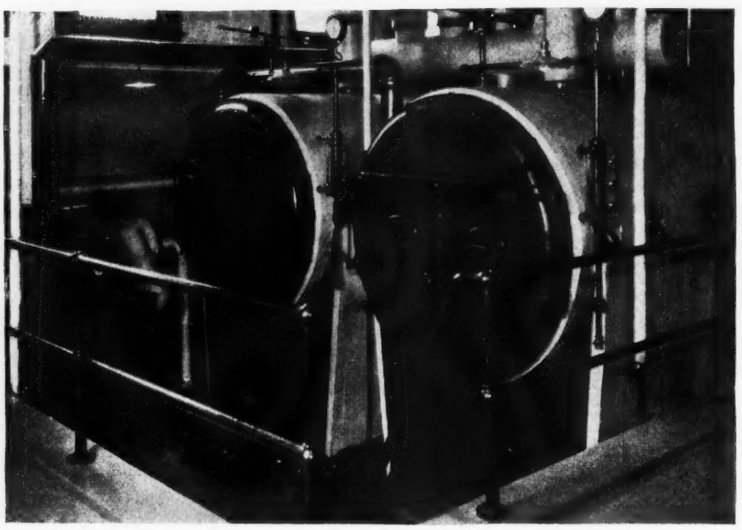
PACIFIC

STEEL HEATING BOILERS



A heating efficiency of 82.35% from Pacific gas-fired boilers operating at 94.4% of rating

How do Pacific Steel Boilers act under gas firing?

To get facts, rather than to depend on claims, the Prairie Oil & Gas Company invited Prof. Sluss of the University of Kansas to make careful tests on two 15,000 square foot Pacific gas-fired boilers installed in their building at Independence, Kan.

Prof. Sluss' records show a heating efficiency of 82.35% with boilers operating at 94.4% of catalogue rating. The average stack temperature was 298° Fahrenheit.

Bear in mind that these tests were made by a strictly neutral and dependable expert, and *under actual operating conditions* rather than in the laboratory.

Much other interesting data was developed. We will be glad to send a full report of this Pacific gas-fired test to building owners, architects and engineers, who are interested in getting every possible heat unit from fuel used. Let us go into detail with you about the facts of Pacific performance.

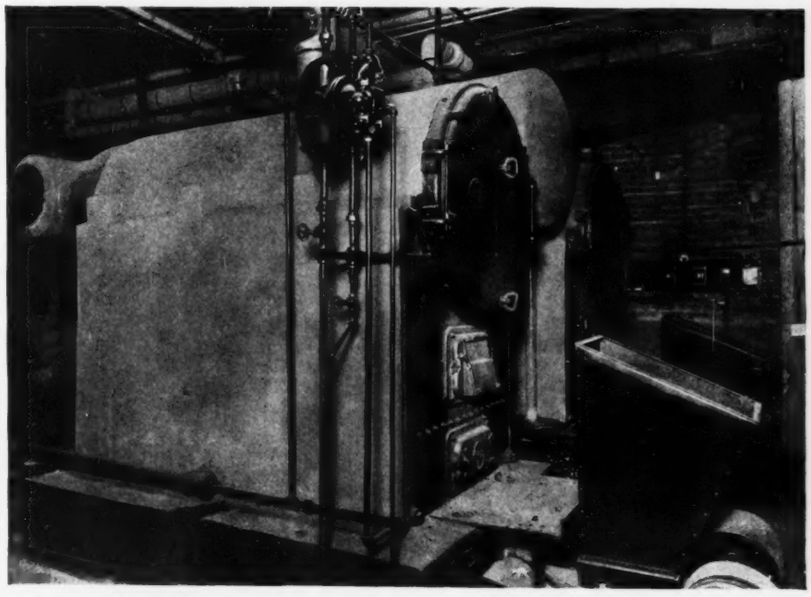
Prairie Oil & Gas Co. building, Independence, Kan. Heated by two 15,000 sq. ft. Pacific Gas fired boilers. Architects, Keene & Simpson, Kansas City. Consulting Engineer, Walter Gillham, Kansas City. Heating Contractor, Sell-Orr Heating Co., Independence, Kan.

PACIFIC STEEL BOILER CORPORATION

Factories: Waukegan, Ill., Bristol, Pa.

Sales Offices in 58 Cities

Division of United States Radiator Corporation, Detroit



Two McDonnell & Miller Self-Cleaning Duplex Feeds installed on Pacific Boilers equipped with "Iron Firemen." W. S. Adams, Heating Contractor; R. N. Hunt, Architect.

The most *vital* job in the boiler room

WHAT job in a boiler room compares in importance with maintaining the proper water level in the boiler? What job asks as big a penalty for failure to handle it properly?

This matter of watching the water line is the easiest thing for a man to overlook—the last thing that should be trusted to the slender, easily snapped thread of human memory. It is a job for a mechanical device with a memory of cast iron and bronze!

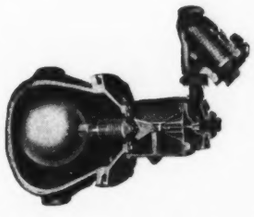
—and the *toughest* job

Even when handled mechanically, the maintaining of the boiler water line is a tough job. That is why we have said repeatedly that "only the best boiler feeder is good enough." When the circuit to the condensation pump fails, the feeder you specify or install must be capable of feeding the entire feed water requirements of the boiler. It must do this always—even when the water is hard or rank. Isn't this a job that should only be entrusted to a *self-cleaning* feeder—a feeder with rotary valves that "stay new"?

A Practical Necessity With Automatic Firing

On the oil or gas fired job the boiler water line problem looms still bigger. Automatic firing encourages neglect of the water line. What protection against this neglect is quite so logical and effective as the McDonnell & Miller Self-Cleaning Duplex Feeder. It not only protects the boiler from low water, but also protects the owner and tenants from shut-downs of the burner and the trouble, and expense that always accompanies shut-downs. This fact is each day taking deeper root. Many prominent engineers are insisting that every oil or gas fired job be equipped with a McDonnell & Miller Self-Cleaning Duplex Feeder.

Send the coupon for facts.



Now a lower priced feeder for smaller boilers

The New McDonnell No. 30 Safety Feeder is made for protecting the smaller boiler against low water. Its lower price is due to the smaller size and ingenious simplicity. Use the coupon to request facts about it.

McDONNELL & MILLER, 1314 Wrigley Bldg., Chicago
Eastern Office: Grand Central Terminal Bldg., New York, N. Y.

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"

McDonnell & Miller,
1314 Wrigley Bldg.,
Chicago.

Please send facts covering feeders checked:
McDonnell & Miller Self-Cleaning Duplex Feeders.
McDonnell Safety Feeder.

Business.....

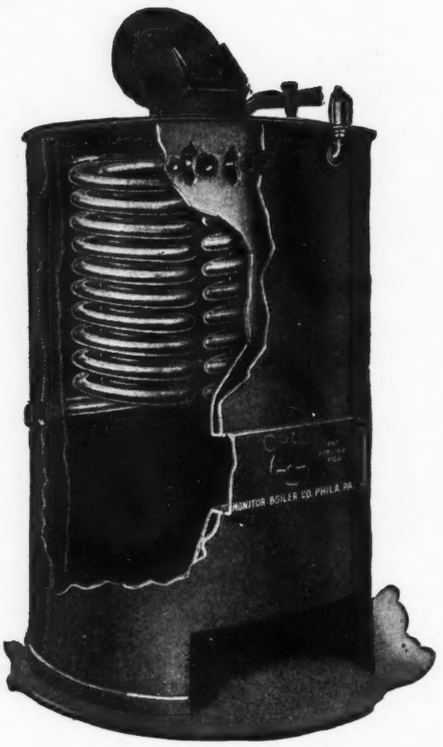
Individual.....

Street and Number.....

City and State..... HV9

COIL

STEEL HEATING BOILERS AND WATER HEATERS



FOR OIL BURNING

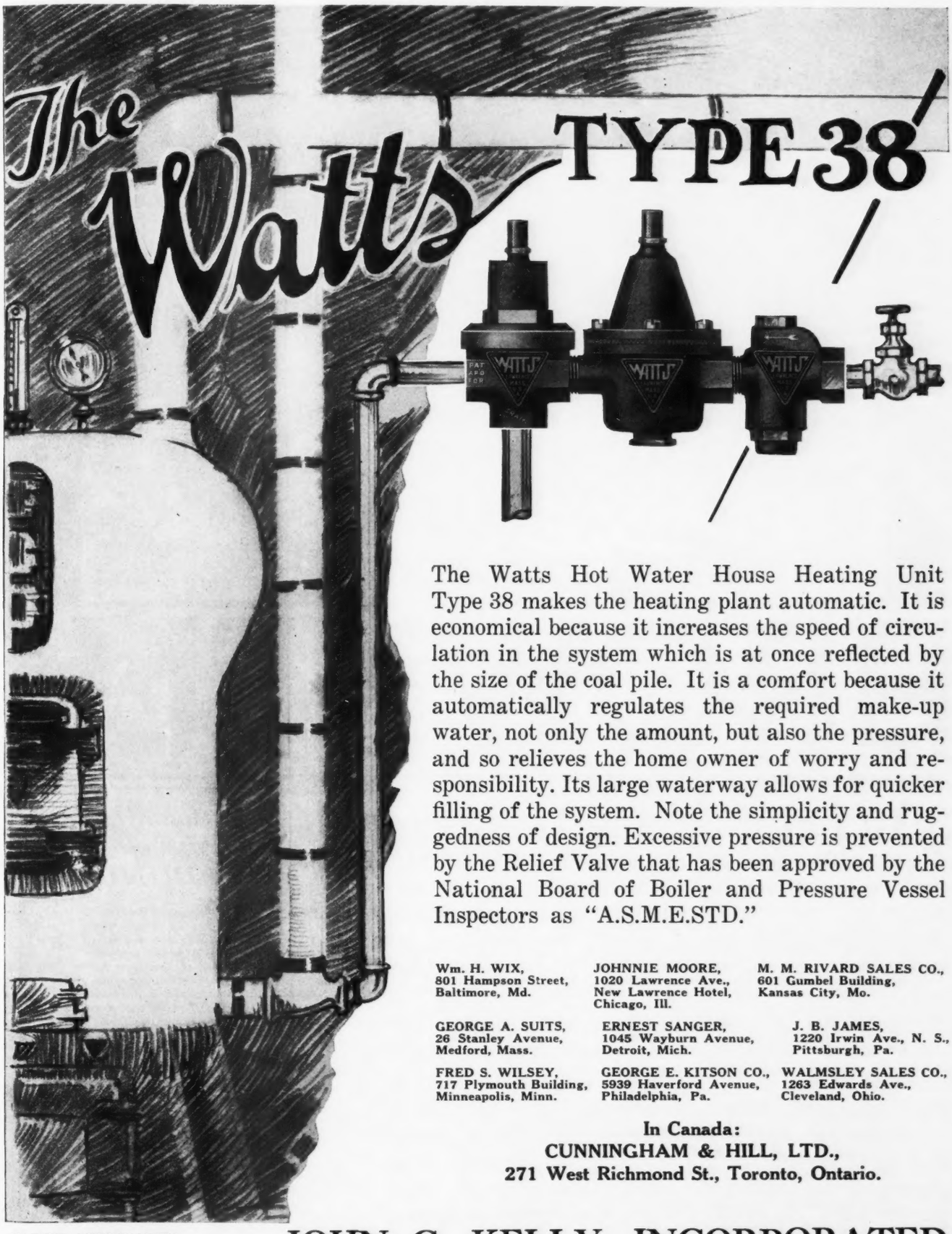
In the Coil Boiler, all the heating surface is in the combustion chamber. Consequently every bit of it is reached directly by the radiant heat.

This together with the fact that the Coil Boiler has in many cases 50% more heating surface than the average boiler is convincing proof of superiority. Hundreds of contractors who have installed the Coil Boiler report a savings for their customers of up to 30% on fuel bills.

Write us for complete catalogue and detailed information.

All heating surface, being in the combustion chamber, is reached directly by the radiant heat of the fire and is tremendously effective as compared with indirect or flue surface.

MONITOR BOILER COMPANY
1505 Race Street :: :: Philadelphia, Pa.



The Watts Hot Water House Heating Unit Type 38 makes the heating plant automatic. It is economical because it increases the speed of circulation in the system which is at once reflected by the size of the coal pile. It is a comfort because it automatically regulates the required make-up water, not only the amount, but also the pressure, and so relieves the home owner of worry and responsibility. Its large waterway allows for quicker filling of the system. Note the simplicity and ruggedness of design. Excessive pressure is prevented by the Relief Valve that has been approved by the National Board of Boiler and Pressure Vessel Inspectors as "A.S.M.E.STD."

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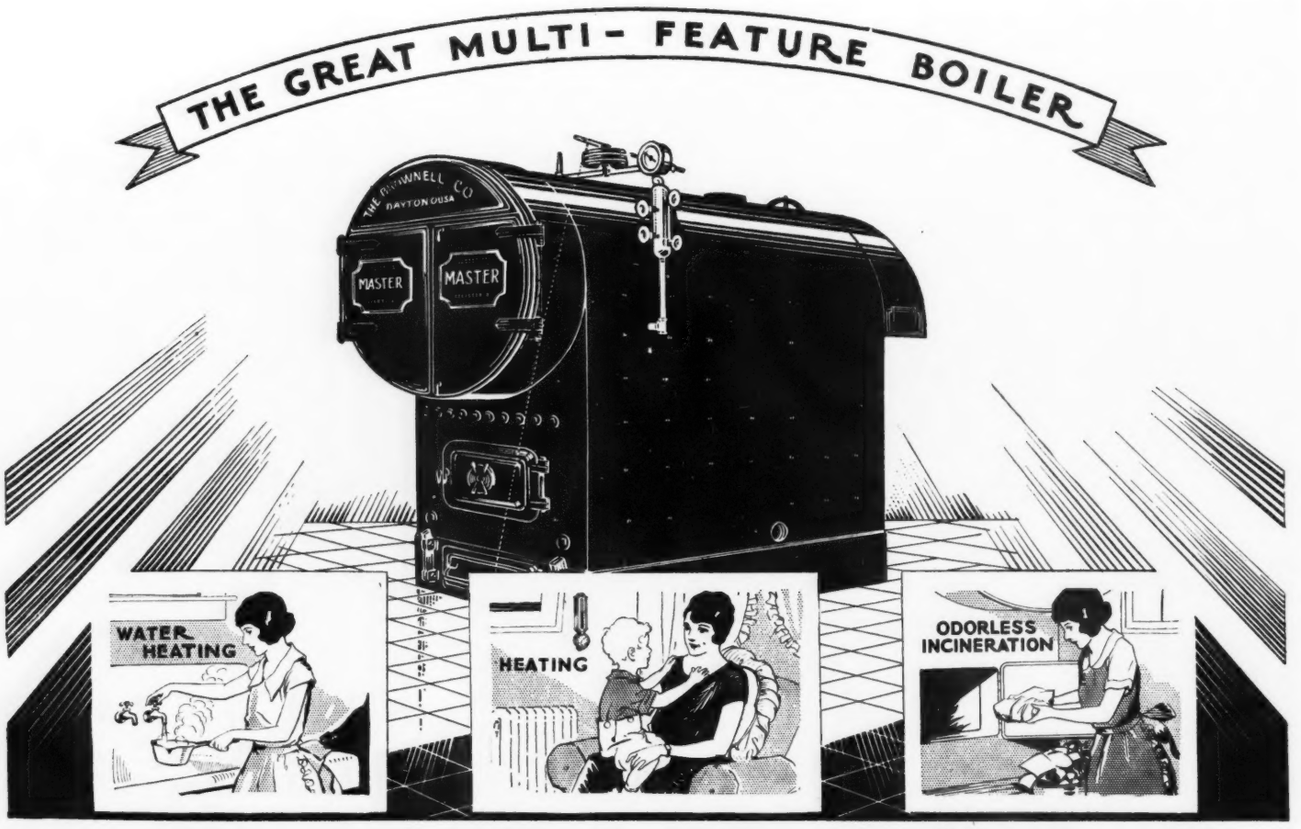


BROWNELL

An Engineering Masterpiece

The matchless performance of the Brownell "Master" Heating Boiler is the strongest possible evidence of Brownell unrivaled leadership. Here is an outstanding boiler, possessing features that will save hundreds of dollars on the initial boiler room investment. A wonderfully efficient boiler---producing quick, comfortable heat; an all-season domestic hot water heater; and when oil-fired, providing an odorless incinerator; thus eliminating the cost of outside or separate accessories.

Nothing in modern manufacturing practice could be more efficient or more scientific than the precautions which Brownell takes to make sure of flawless quality and workmanship. Master-craftsmen produce completely all Brownell products in the great Brownell plant, where seventy-four years of boiler room experience dominate this dependable line.

Get Boiler Bulletin M-65

The Brownell Company, Dayton, Ohio

Established 1855 — Offices in Principal Cities.

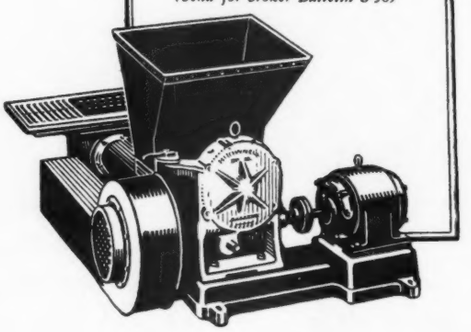
BROWNELL ELECTRIC WELDED STEEL BOILERS

BROWNELL AUTOMATIC UNDERFEED STOKERS

Automatically Controlled FIRING

and here again, Brownell engineering brings you added comfort and economy in perfect mechanical Firing of Furnace or Boiler at exactly the temperature you wish, regardless of weather conditions. Set the clock thermostat at the heat you want and the fire is regulated automatically, resulting in a steady even temperature and a saving in fuel of 15% to 50%.

(Send for Stoker Bulletin S-50)



The Albert Pike Hotel, Little Rock, Ark.
Eugene John Stern, Architect.
El Dorado Heating & Plumbing Co., Heating Contractors.
Heated by Three 9,000-foot Ross Steel Heating Boilers.

Judge boilers *by these* 10 POINTS of Superiority

1—Unrestricted circulation.
2—Smokeless.
3—Unusually large direct heating surface.
4—Full length self-cleaning convex crown sheet.
5—Tubes easily cleaned from outside.
6—One large body of water.
7—Indestructible smokeless arch with circulating baffles.
8—Large central flue.
9—All seams electrically arc welded—tubes expanded in heads.
10—Three-pass fire travel.

Write for Catalog—Ideal for Oil or Gas Burning.

The Frost
MANUFACTURING COMPANY
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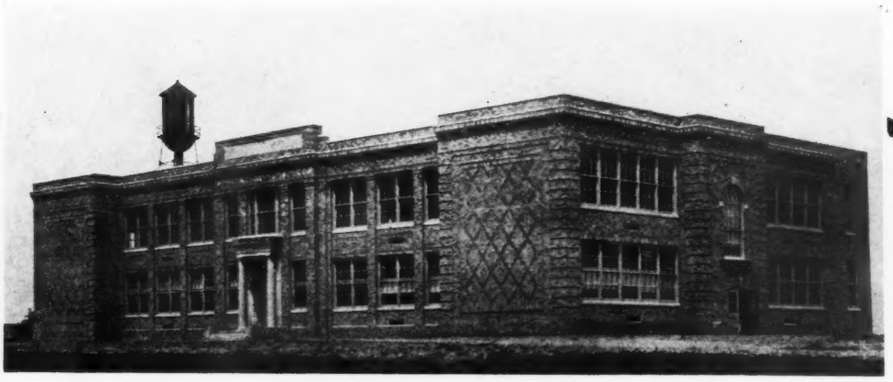
Dealers in Most Leading Cities.

ROSS STEEL BOILERS

COATESVILLE BOILERS



AVON-GROVE HIGH SCHOOL
Located Midway Between Avondale and West Grove, Pa.

It is a tribute to **COATESVILLE BOILERS** to have been selected for this modern school building. Good judgment and planning perhaps, explain this.

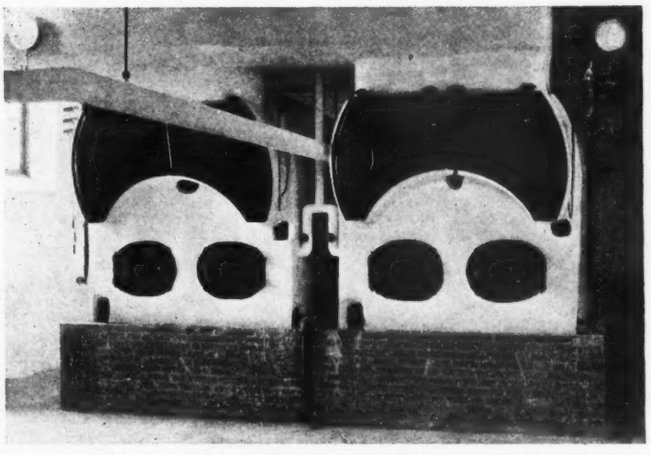
"ONCE A COATESVILLE BOILER ALWAYS A COATESVILLE BOILER."

Coatesville dependability and efficiency cannot be denied—Coatesville Boilers are built to last.

E. Wm. MARTIN
Architect

CALVERT & BARNES
Engineers

JAMES D. SCOTT & SON
Heating Contractors



Two Coatesville Oil Burning Boilers
Rear Fired

COATESVILLE BOILER WORKS

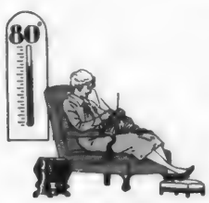
Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.

don't sell cast iron

Playroom

Bed Rooms



Grandma's Room

Bath Room

Living Room

WHEN THE PROSPECT IS ALMOST PERSUADED - *the Bond may close him*

The National *Made-to-Measure-Warmth* idea lets you talk results instead of causes—lets you talk warmth instead of cast iron. This newest idea in modern heating paves the way to the name on the dotted line. And the most convincing way to close your prospect is to offer him the *guaranteed* guarantee—the National Boiler Bond.

Each National Boiler is guaranteed by a National Boiler Bond issued by The Fidelity and Casualty Company of New York, one of the largest financial institutions of its kind in the world. The National Boiler Bond not only guarantees against defects in design, manufacture and materials—but, most important of all, guarantees boiler *performance.* When shown a National Boiler Bond, your customer has every reason to sign the contract with you, for the bond carries conviction of absolute satisfaction and the assurance that you will install material of highest quality and proved dependability.

The National Boiler Line offers you outstanding units in all types and sizes. Each National Product is a leader in its field and has an unimpeachable record of proved performance in all types of structures. Each gives the quality of certain and sustained service that your customers are seeking today. Write for a National Bonded Direct Cast Iron Radiation Loads booklet that shows the number of square feet of cast iron radiation each National Boiler is bonded to heat.

NATIONAL RADIATOR CORPORATION

***Executive Offices:* 55 West 42nd Street, New York, N. Y.**

NATIONAL

Made-to-Measure

HEATING SYSTEMS

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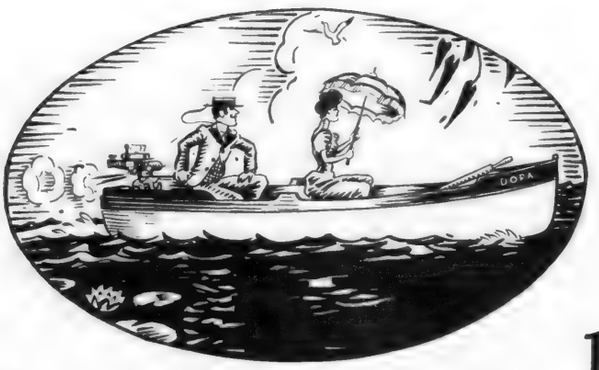
National Radiator
Corporation



It's come to this!

Photo Courtesy, Evinrude Division, Outboard Motors Corporation.

HEATING has changed *too!*

ONLY a few years ago six to eight miles an hour was considered pretty speedy with the little outboard motor.

Now they turn up a thrilling 40 and more.

Industrial heating has been speeded up too!

Modine Unit Heaters have wrought this change. They are instantaneous in operation. Deliver heat down. Warm up the working zone and floors first. Provide better heating at lower installation and operating cost. Let us send you complete facts about this better method of industrial heating. Write today.

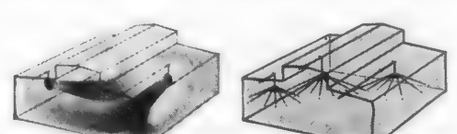
Modine Unit Heater, Model 701 — the original copper radiation equipment — weighs 130 lbs.—suspends from overhead steamline—replaces over 2 tons of pipe coil radiation.

MODINE MANUFACTURING COMPANY
1707 Racine Street *(Heating Division)* Racine, Wisconsin
Branch offices in all large cities
London Office: S. G. LEACH & CO., *Ltd.*, 26-30 Artillery Lane.

Modine *Unit* HEATER

A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS



HEAT AS YOU LIGHT

VENTO

CAST IRON HEATERS

IN the heating of America's great buildings, Vento Cast Iron heaters have for twenty-five years played a leading role. Constantly, from its introduction more than twenty-five years ago, Vento has been the leading choice of Heating and Ventilating engineers.

The widespread use of Vento is due to its unique construction which permits rapid steam circulation as well as the proper breaking up of air currents. Both of these features are necessary to insure full heating efficiency from the entire surface of the heater.

Write today for catalogue giving engineering and test data computed from carefully conducted experiments.

AMERICAN RADIATOR COMPANY

816 South Michigan Avenue, Chicago

40 WEST 40TH STREET, NEW YORK. N. Y.

A heating section that you can stand behind—tested to 400 pounds pressure—immune to corrosion and water hammer. Standard units are sold for pressures up to 250 pounds.

Even the best unit heater is not at its best unless the layout of the system is properly developed.

We therefore consider engineering service a vital factor in the success of every installation. Our engineers will be glad to co-operate with you in solving specific problems.

of the years Forging ahead—

Five years ago the unit heater was a novelty. Then it became a sensation. There was a rush for unit heaters—a rush into the field on the part of manufacturers who were equipped to build equipment of this kind. Today the unit heater is beginning to settle down on even keel. The buyer is becoming more sane. The standards are becoming more exacting. That is why the Thermal Unit now stands out clearly in a crowded field. It has gained this position through sheer force of merit. Its quality and its stamina are now recognized.

Here at last is a unit heater that is built, without consideration of cost, to overcome the weaknesses that are found in "just a unit heater." The heating section of the Thermal Unit is an object-lesson in combining ideal efficiency with abundant strength. It is cast in one-piece of silicon-aluminum. There is not a joint or weld in the entire heating section. From the steam passages to the uttermost tip of the extended heating surfaces there is not a single break in the solid metal to interfere with the free and unimpeded travel of heat. So the integral construction not only means strength but also exceptional efficiency!

Throughout—from the liberally rated motor to the airplane-wing design of the louvers and fins—Thermal Units possess that ideal combination of rugged construction and refinement of design that has made them first choice of foremost engineers and contractors.

These men who know unit heaters have found the Thermal Unit best in the "test run" of the years. That is why it is forging ahead at an unprecedented rate.

Only Thermal Units have *all* of these advantages

1. A one-piece silicon-aluminum heating section tested to 400 pounds hydrostatic pressure and regularly listed for steam pressures up to 250 pounds.
2. A heating section that is totally free from joints or connections—leakage or losses in heat transmission is *impossible.*
3. Airplane design in air passages, fins, and louvers means minimum resistance to air delivery and greater projection of heat.
4. Heating section is so ductile that it cannot even be damaged by freezing while in service.
5. Liberally rated motor is suspended so that vibration is minimized. As a result, Thermal Units are noiseless.
6. Thermal Units are backed by an engineering service that invariably "makes the layout justify the outlay." They are specifically guaranteed by a highly responsible manufacturer.

THERMAL UNITS CO.

A Subsidiary of the Mechanical Mfg. Co.

Pershing Road and Loomis Street, Chicago, Ill.

Eastern Office: 30 Church Street, New York, N. Y.

THERMAL UNIT
INTEGRAL SECTION
HEATERS
PATENT PENDING

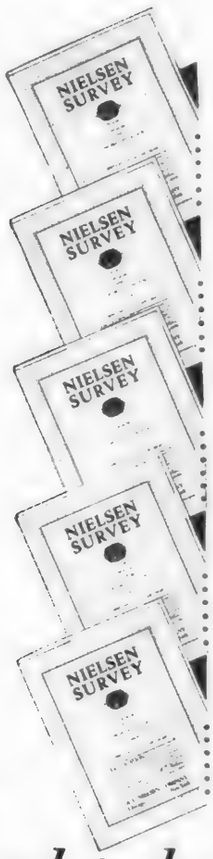
Approved by Investigating Committees of Architects and Engineers

Your Decision on Heating and Ventilating *Is Important . . . Investigate Carefully*

Take time to visit schools and other buildings which are using PeerVent Units, or at least write a few letters of inquiry about them. Find out how well PeerVent Units are liked —how noiselessly and efficiently they operate under varying conditions . . . Consider, too, the proven durability of PeerVent Units. Units built by this Company **eighteen years ago** are still in service and giving perfect satisfaction. The latest PeerVent machines are therefore the result of long experience—backed by the pioneer manufacturers of heating and ventilating units . . . Write for Catalogue to the Peerless Unit Ventilation Company, Inc., 718-34 Crescent Ave., Bridgeport, Conn. Please mention whether you would like to see our local sales representative.

PEERVENT

HEATING AND VENTILATING UNITS



SURVEY No. 54. Two abutting buildings, 90′ x 200′ and 50′ x 92′, presented a heating problem unsolved by direct radiation. A change to York Units brought interesting results.

SURVEY No. 55. Four buildings, 33,100 sq. ft. of floor space, formerly heated by direct radiation, now heated by York Units. The result is worth careful study.

SURVEY No. 56. Comparative results of direct radiation and York Units in a group of foundry, machine and assembly buildings.

SURVEY No. 57. York Heaters in an Engine Roundhouse. Extremely severe heating handicaps, with icy incoming locomotives. Pipe coils scrapped and satisfactory conditions achieved.

SURVEY No. 58. Two buildings of nearly equal heat requirements, one heated with direct radiation, the other with York Units. Analysis of results, with actual figures.

"Heat with Unit Heaters"

Send today for these IMPARTIAL SURVEYS of York Unit Performance

EVERY plant owner and engineer contending with present unsatisfactory plant heating, every *prospective* purchaser of heating equipment for a new plant, is faced with the problem of securing unbiased performance — facts concerning proposed heating systems. Even then he must fit the findings to his own special conditions.

Here are several reports on the operation of York Heat-Diffusing Units, made by an independent engineering organization, recognized for its accuracy and efficiency—the A. C. Nielson Company of Chicago. Each report analyzes heating conditions in some one plant, gives figures and states facts which *can* be of great value to other plant owners and engineers.

A copy of any one of these Surveys will be gladly sent on request. Specify by Number the one you wish. Address the A. C. Nielson Company, 4450 Ravenswood Ave., Chicago, Ill., or York Heating & Ventilating Corp'n, 1539 Sansom St., Phila., Pa.

Super-Fin Coils are standard equipment for York Heat-Diffusing Units. They represent an important engineering advance in construction of extended surface radiation. There are no joints to leak—all have been fused; expansion and contraction strains are eliminated by U-tube construction; natural pitch of tubes assures drainage; each coil tested to 1000 lbs. hydrostatic pressure and guaranteed up to 200 lbs. operating pressure. Write for information on use of Super-Fin in all blast systems of radiation.

Details of U-Bend Construction

YORK Heat-Diffusing Unit

YORK HEATING & VENTILATING CORPORATION
PHILADELPHIA

Jenkins VALVES ARE ALWAYS MARKED WITH THE "DIAMOND" TRADE JENKINS MARK

Jenkins Bros

Tested to assure a wide margin of safety

THOROUGHNESS is the watchword in making Jenkins Iron Body Valves . . . close attention to details, from the foundry to the final test. A wide margin of safety in every valve is assured by tests under pressures higher than the recommended working pressure. Fig. 146, Jenkins Standard Iron Body Cross Valve, shown, is made flanged or screwed for 150 pounds steam or 250 pounds water. Jenkins Bros., New York, Boston, Philadelphia, Chicago . . . Jenkins Bros., Ltd., Montreal, London.

Gone are the days of "ostrich ways"

in rating pump capacity

Published Ratings of Vacuum Heating Pumps

should be supported by guaranteed air and water capacity

That two different makes of vacuum heating pumps are rated for the same number of square feet of direct radiation does not establish that the two pumps will serve a heating system equally well. . . . To assume that they will, is "playing ostrich."

COMBINED air and water capacity, *determined by actual test,* and the horsepower required to attain this capacity is the only reliable basis to use for comparison. The published rating, in radiation surface alone, for a given pump is dependable only if the pump will deliver *simultaneously* a volume of air and water sufficient to handle that amount of radiation under all conditions.

For the thirteen years that Jennings Vacuum Heating Pumps have been on the market, Nash engineers have recognized these facts. Having determined from experience the volume of air and water that a pump must handle in order to serve a given radiation satisfactorily, they have rated Jennings equipment accordingly.

The ratings exhibited in the table are sufficient to serve any vacuum heating system, reasonably well installed, for the life of the building. Pumps of smaller capacity should not be considered.

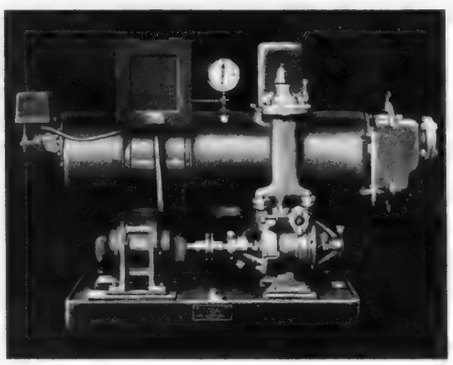
CAPACITIES OF JENNINGS VACUUM HEATING PUMPS

Pump Size	Equivalent Direct Radiation Square Feet	Water Capacity G.P.M.	Air Capacity Cu. Ft. Per Min.	Orifice Diameter Inches	MOTOR HORSEPOWER			
					10 Lbs.	20 Lbs.	30 Lbs.	40 Lbs.
T	2,500	4	3	1/16	1/8	1/8	1	1 1/2
U	5,000	9	3	1/16	1/8	1/8	1	1 1/2
V	10,000	14	6	5/64	1	1	1 1/2	2
B	16,000	22	9	3/32	1 1/2	2	3	5
C	26,000	35	15	1/8	2	3	5	5
D	40,000	60	19	5/32	3	5	5	7 1/2
E	65,000	90	34	3/16	5	5	7 1/2	10
F	100,000	140	50	7/32	7 1/2	10	15	15
*G	150,000	200	102	5/16 & 5/16	10	15	UPON REQUEST	
*H	300,000	400	171	2-7/16 & 1-5/16		UPON REQUEST		

* *The last two sizes are out of the manifold type.*

Jennings Ratings Affirmed By Test

Published Jennings Vacuum Heating Pump capacities are substantiated by actual test. Before shipment every Jennings Pump is tested at the factory. Working conditions are reproduced. The air and water capacities are accurately determined. The horsepower is measured. Each pump is tested with its own motor and control equipment. Every part of the assembly must demonstrate that it is working perfectly.



JENNINGS VACUUM HEATING PUMP

A certified report of the results is furnished to the purchaser. The prospective user, his engineer, or any other person designated, may witness the test.

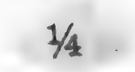
Water capacity is determined by measuring the volume in g.p.m. that the water impeller of the pump removes from the receiving tank under 10 in. vacuum and delivers against the specified discharge pressure at the pump. This volume of water must be delivered at the same time that the pump is handling its rated maximum quantity of air.

Calibrated Orifice to Measure Air Capacity

Air capacity is measured by means of a calibrated orifice of specified diameter, reamed in a brass plate one-eighth inch thick, located in the pump suction and communicating with the receiving tank. This orifice measures the cu. ft. per min. of air that the air rotor of the pump withdraws from the receiving tank and discharges to the atmosphere. Air capacity is determined at the same time that the pump is delivering its maximum rated volume of water.

CERTIFIED REPORT OF TEST

Compare vacuum heating pumps by combined maximum water and air capacity and by horsepower. Call for a certified factory test report, to be substantiated where convenient by a second test on the job.

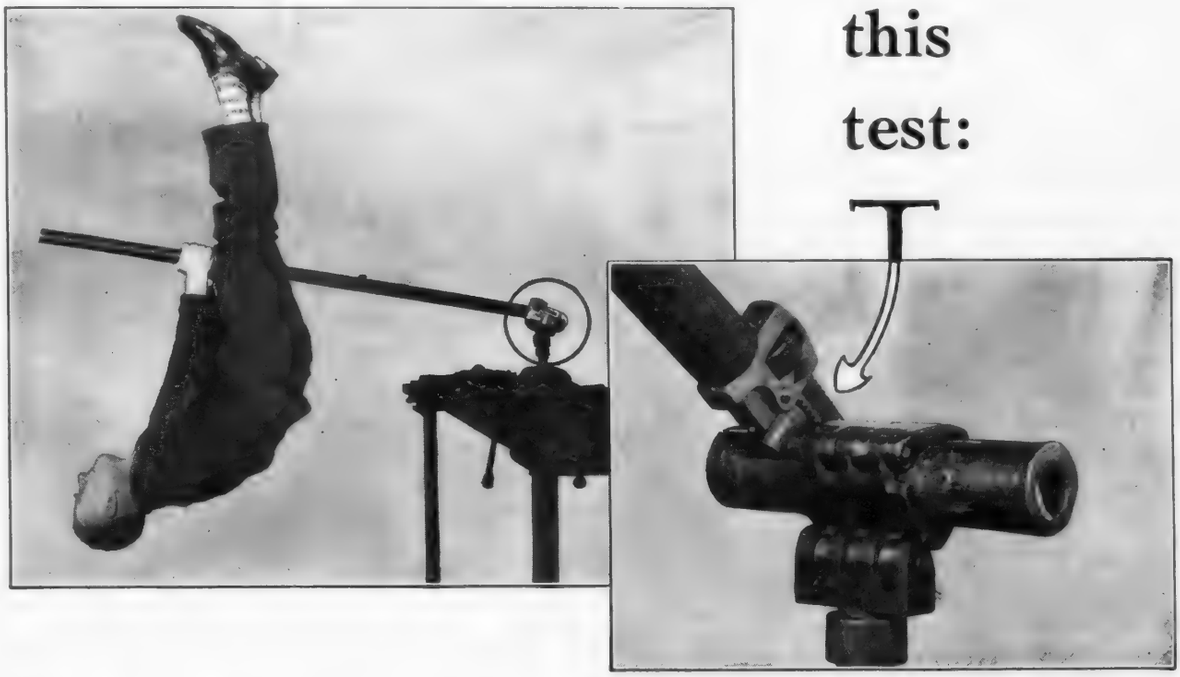


STANDARD TEST ORIFICE

Jennings Pumps

NASH ENGINEERING CO.
SOUTH NORWALK CONN., U. S. A.

They came and saw this test:



and then they went and bought TEN THOUSAND MASTER STILLSONS

A test that puts 9,000 inch pounds on the jaw and bar of a wrench makes a mighty convincing proof of its strength and toughness.

That's what 160 pounds of red headed mechanic does on the bar of the above contraption.

In a middle western city we got a group of men who knew good wrenches to come in and see the Walworth Master Stillson in action. They were superintendents of manufacturing concerns, railroad master mechanics, refinery superintendents and maintenance engineers. After which, these men went and bought ten thousand Master Stillsons, put them to work and they've been going strong on the job ever since.

The Master Stillson is made in eight sizes, from 6 to 48 inches. Its new red handle and the same old Walworth Stillson trade mark will identify it for you.

The Walworth Parmelee

The close-up illustration shows a Walworth Parmelee holding a piece of pipe against the 4½ ton twist of the Master Stillson. This toothless wonder of a pipe wrench is especially useful for work in close places and to prevent marring brass pipe and smooth rods.

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa., and Attalla, Ala.

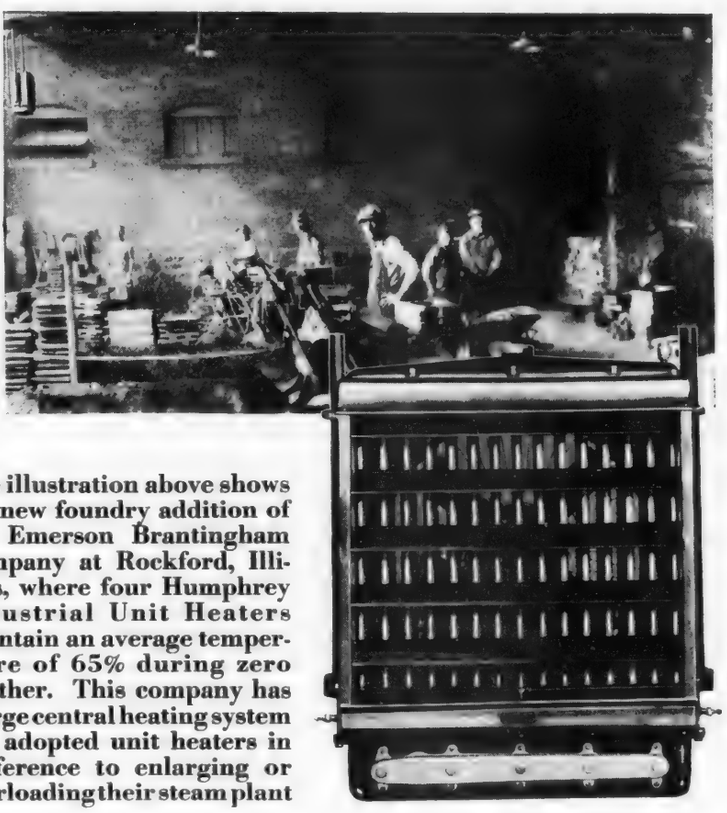
Distributors in Principal Cities of the World

Walworth Company Limited, 620 Cathcart St., Montreal, P. Q.
Walworth International Co., New York, Foreign Representative

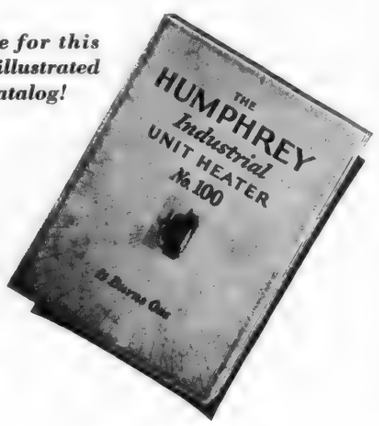
Gas Unit Heaters

provide the most Efficient, Flexible and Economical form of Industrial Heat

Wherever heat is needed, the Humphrey Industrial Unit Heater delivers an abundance of penetrating warmth. It burns gas and entire factories are efficiently heated through this most modern and flexible method of industrial heating. The advantages of the Humphrey Industrial Unit Heater include the elimination of licensed firemen, boilers, and handling of coal. There is no smoke, dust, dirt, or ashes. Heat can be produced instantaneously, and can be turned off when not required, thus eliminating overheated conditions. Compact in size, designed for ceiling suspension, the Humphrey Industrial Unit Heater occupies no expensive floor space. This new method of industrial gas heating embraces many outstanding construction features. No flame is visible—all gas is consumed in an enclosed chamber—the heat is directed downward where it is most needed—this results in operating efficiency so desirable to progressive manufacturing methods of today. Write now for the catalog illustrated at the left.



Write for this free illustrated Catalog!



The illustration above shows the new foundry addition of the Emerson Brantingham Company at Rockford, Illinois, where four Humphrey Industrial Unit Heaters maintain an average temperature of 65% during zero weather. This company has a large central heating system but adopted unit heaters in preference to enlarging or overloading their steam plant

Handles 100,000 B. T. U. hourly input delivering 1,800 cubic feet of heated air per minute to thirty-eight degree temperature rise. Delivered efficiency, 83%.

The Humphrey Industrial Unit Heater

GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN

New York, 44 W. Broadway

San Francisco, 135 Bluxome St.

For a Very Little More
Save a Great Deal More

Leading Architects and Heating
Contractors Specify Barnes & Jones

QUALITY HEATING SYSTEMS

for every type of building

The satisfactory operation and permanent efficiency—backed by 30 years' experience in perfecting heating appliances—stamp BARNES & JONES systems with the mark of quality.

Barnes & Jones

The Sign B&J *of Quality*

Vapor and Vacuum Heating Systems of Proven Quality

128 Brookside Ave.,
Jamaica Plain, Boston

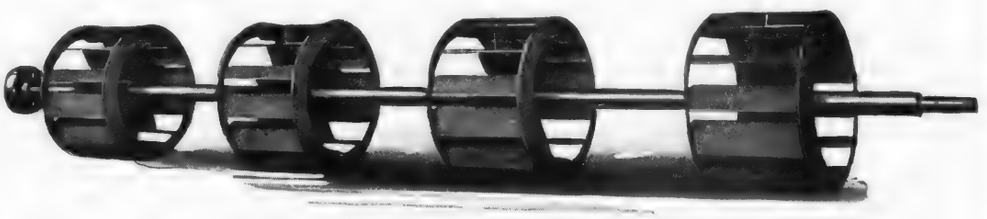
101 Park Ave.,
New York City

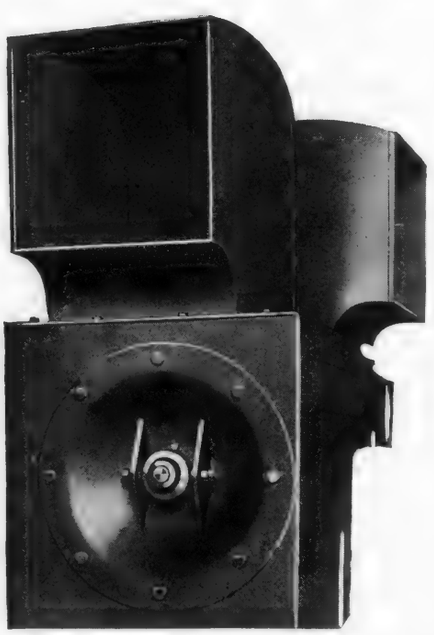
NEW EFFICIENCY

Cased Aerofin Heating Coil

When the new Highboy and Lowboy Units were being designed every effort was made to provide the highest possible efficiency. The heating element used is UNIVERSAL AEROFIN —the standard, light-weight, non-corrosive copper coil, good for any steam pressure from 2 to 200 lbs. The heating unit will drain properly in either upright or flat position.

Multi-rotors and Shaft





Note Paneled Heater Casing

The whole heating coil is cased in steel slides, making it easy to withdraw the coil and change steam and drip connections end for end.

The rotors are of improved multiblade design with modern backward-tipped double-curved blades. All rotors are mounted on one shaft and altho each operates in an individual housing, all can be removed from either end of the unit without dismantling the housing. Ball bearings are used at each end of the shaft, recessed in heavy steel bowls which serve as end plates thru which rotors and shaft may be withdrawn.

If you are interested in getting balanced, carefully designed efficient unit heaters, by all means let us tell you more about Buffalo Highboy and Lowboy Units.

Branch offices in all principal cities.

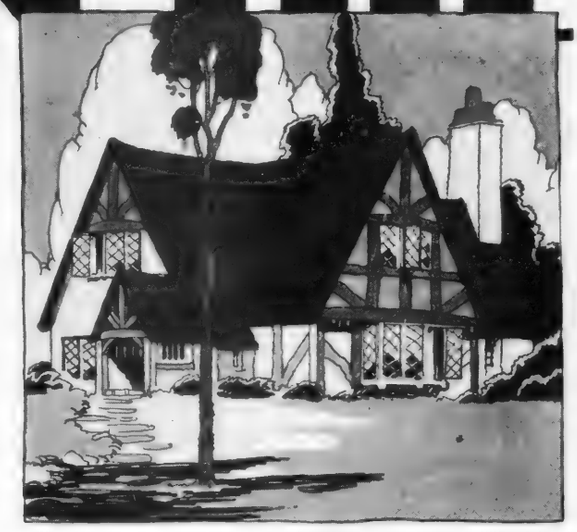
Buffalo Forge Company

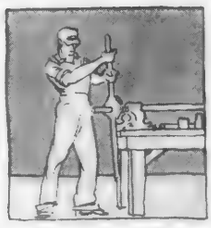
480 Broadway Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co. Ltd. Kitchener, Ont.

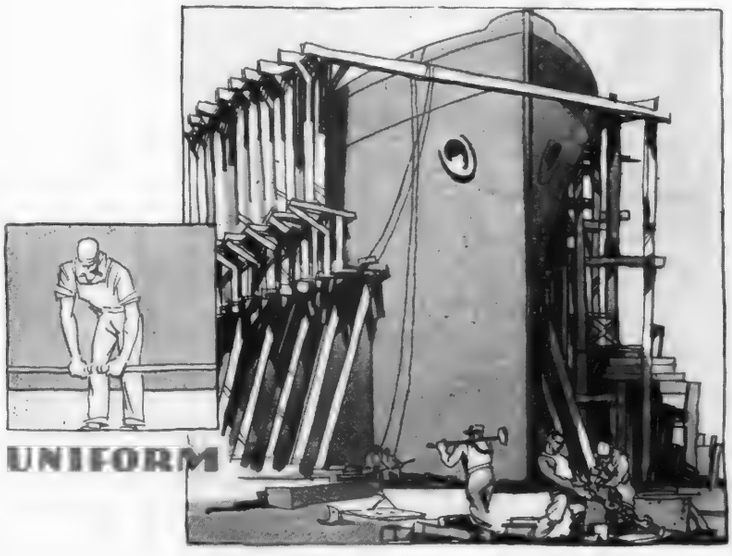
"Buffalo" "Highboy" and "Lowboy" Unit Heaters

ON THE JOB



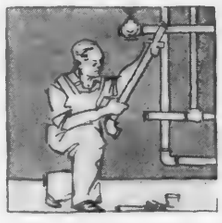


~EASY~
THREADING



UNIFORM

Since
1828



ACCURATE

Whenever you require good, dependable pipe, whether it be for a house or a ship, a power plant or what not, think of "Spang" —the welded steel pipe backed by a century of skilled manufacturing experience.

SPANG, CHALFANT & CO., INC.

General Offices: **Clark Building, Pittsburgh, Pa.**

Sales Offices: Chicago, Ill., New York, N.Y., St. Louis, Mo., Pittsburgh, Pa., Tulsa, Okla., Los Angeles, Cal. *Mills:* Etna, Sharpsburg, Ambridge, Pa.

SPANG

WELDED STEEL PIPE

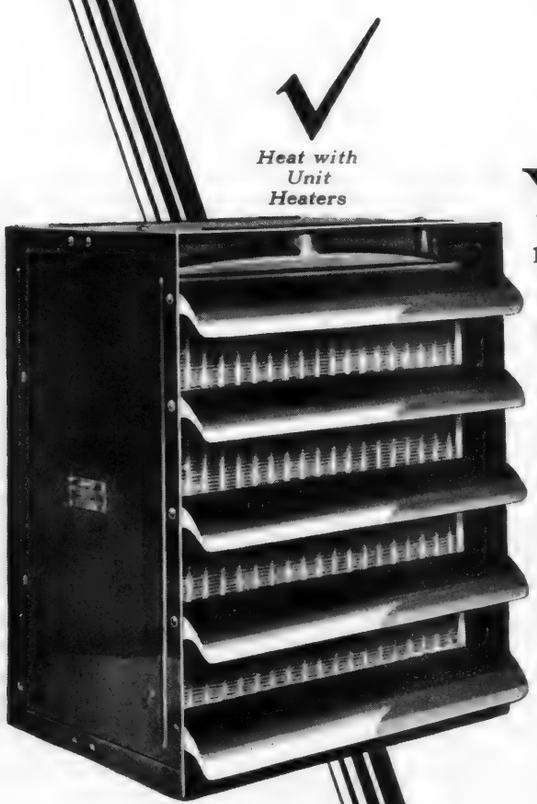
LOWER *heating costs*

LOWER *first costs*

LOWER *installation costs*

VENTURAFIN
TRADE MARK REG.

METHOD OF HEATING



Heat with Unit Heaters

YOU can heat more economically with the Venturafin Method of Heating. Here are the reasons:

1. Venturafin Units can be installed with fewer fixtures and fittings.
2. Venturafin Units force heated air directly where it is needed. They give positive heat control and eliminate wasteful heating of ceiling areas without first heating working areas.
3. Venturafin Units are adaptable to practically any position without loss of efficiency. They can be mounted on wall or ceiling with ordinary ¾-inch hanger pipes, an exclusive American Blower feature—or they can be used as a floor stand unit with a recirculating box. Venturafin Units are furnished with individually adjustable louvres which permit the forcing of heated air in any or several directions simultaneously.
4. Venturafin Units are practically indestructible. They are equipped with non-corrosive steam heating coils—the well-known Ventura fan manufactured by American Blower—and an electric motor made by the world's largest motor manufacturer—all housed in sturdy, die-formed, beautifully finished steel case.

There are many other reasons, too, why the Venturafin Units cost less to buy, install and maintain . . . why they offer unusual economies in heating factories, shops, stores, garages, and many other types of buildings.

Phone your heating contractor. He will be glad to tell you more about the Venturafin Method of Heating and to show you how you can materially reduce your annual heating costs. Or, mail the coupon. No obligation either way. (900)

The Venturafin Method of Heating for stores, salesrooms, factories, shops, garages and many other types of buildings.

COUPON

American Blower Corp.
6000 Russell St., Detroit

Please send me your 24-page Venturafin Book

*Name*_____

*Address*_____ *City*_____

AMERICAN BLOWER CORPORATION, DETROIT, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

American Blower

VENTILATING; HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

Here's the book

that takes out *all* of the guess-work and *most* of the figure-work in the selection and layout of Fan System Heat-Surface ~ ~ ~

COMBINING in one compact Bulletin complete Data on LOW PRESSURE AEROFIN, UNIVERSAL AEROFIN, and HIGH PRESSURE AEROFIN,—the original service-proved, non-ferrous, encased Fan System Heat-Surface,—this thumb-indexed Book is as usable as it is useful. Extensive Tables of Final Temperatures and Condensations at various Steam Pressures, Physical Data, Sizes of Pipe Connections, Air Friction Tables, large Temperature Effects Charts on Linen, Notes on Thermostatic Control, and 23 Piping Diagrams in 4 colors, based on the long actual experience of AEROFIN users, among them America's most brilliant Engineers. A truly invaluable Book for your constant use. Your copy will be forwarded gratis upon request to Newark, on your business letterhead. *Ask for Bulletin V-99.*

HIGH PRESSURE AEROFIN 25 to 350 lbs.

LOW PRESSURE AEROFIN Up to 50 lbs.

UNIVERSAL AEROFIN 2½ to 150 lbs.

AEROFIN
is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

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United Artists Building DETROIT
Oliver Bldg. PITTSBURGH
Paul Brown Bldg. ST. LOUIS

The new PIERCE

Pierce, Butler & Pierce Manufacturing Corporation announces the New Pierce-Pebco Round Jacketed Boiler—a practical and highly efficient heating unit for small and average sized homes.

Distinctly Modern in Design—its trim metal jacket is beautifully finished in flaming orange and black with black and nickel-plated trimmings.

Highly Efficient—scientifically designed flues and water ways with large amount of prime heating surface insure maximum heat absorption and economy of operation.

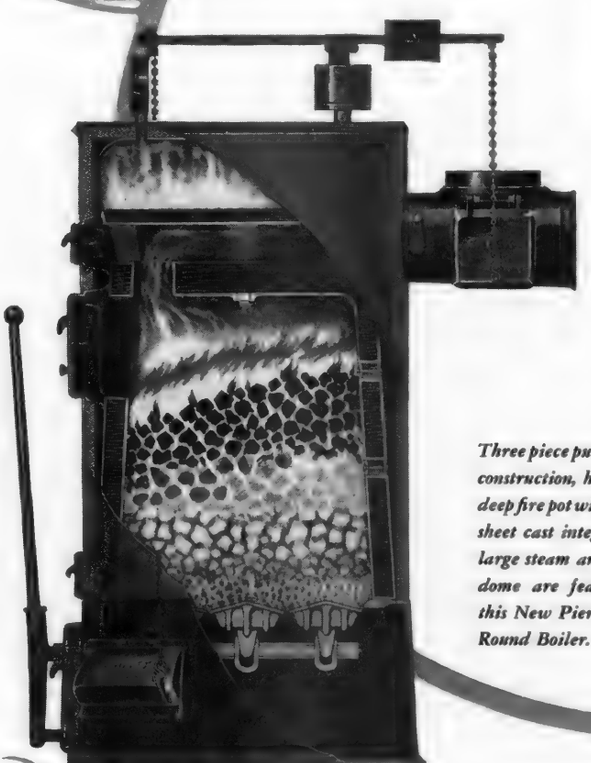
Moulded Air-Cell Insulation—heat conserving—adds to its efficiency.

Deep Fire Pot—gives large fuel capacity and long firing period.

Low Water Line

Fully Equipped—with either steam or water trimmings.

Automatic Draft Regulation—assures constant temperature control and economy of operation.



Three piece push-nipple construction, high base, deep fire pot with crown sheet cast integral and large steam and water dome are features of this New Pierce-Pebco Round Boiler.

WRITE FOR

PIERCE, BUTLER

41 EAST 42ND STREET

Western Distributors: The Kellogg-MacKay Co., 1351 W. 37th Pl., Chicago, Ill.

PEBCO *round jacketed boiler*

The New Pierce-Pebco embodies all the tried and proven principles of the Pebco Boiler of other years. It is built to deliver a life-time of economical and carefree heating service.

The two-piece jacket—finished in colors, with continuously formed top flange and moulded air-cell insulation permanently attached—is easily and quickly assembled.

Three Piece Push-Nipple Construction—easy to assemble, easy to handle, no excessively heavy parts.

High Base—prevents ashes from choking draft.

Flat Rocking and Shaking Grates—easily operated—waste no fuel.

Doors and Frames—are tight fitting, being ground to a true surface, and are of large area for easy firing and removal of ashes.

Dome Section—is of ample area for the liberation of steam in the steam boiler and holds sufficient reserve of water in the water boiler to maintain room temperature after the fire has been banked for several hours.

Thoroughly Tested—by competent engineers, its unusually high efficiency and economy of operation have been proven.

FORMATION

& PIERCE MANUFACTURING CORPORATION
NEW YORK CITY

Ames Iron Works Division, Oswego, N. Y., Mfrs., Ames Firebox Boilers

The Dunham Differential Vacuum Heating System

will furnish comforting warmth for the residents of Philadelphia's beautiful new apartments

The Drake

Architect: Ritter & Shay
Consulting Engineer: Isaac Hathway Francis
Heating Contractor: V. N. Welamb Co.
General Contractor: Murphy Quigley Co.

IN Philadelphia, at Spruce Street, just west of Fifteenth, rises a new and beautiful apartment which Philadelphians will know as The Drake. In this monumental structure, towering high above every other edifice and making a most conspicuous addition to Philadelphia's skyline, will live those who seek a residence of distinction—the privacy of a home—the facilities and advantages of a modern hotel and the cuisine of a super-excellent cafe . . . Due to its location The Drake is convenient to railway stations, important shopping centers, office buildings, banks, theatres, clubs and churches. Suites are arranged in simplex and duplex, both furnished and unfurnished.

The Dunham Differential Vacuum Heating System is being installed. This is of material interest alike to the management and to the tenants. Steam, in the Dunham Differential System, is circulated under a vacuum throughout the whole system, the degree of vacuum determining how "hot" or "cool" the steam will be. This steam of varying temperatures insures large fuel savings for the management and healthful heat comfort for the tenant.

There is approximately 192,000 sq. ft. of rentable floor area with 40,461 sq. ft. of radiation, there being a total of 1,432 radiators.

C. A. DUNHAM CO.

DUNHAM BUILDING

450 East Ohio Street :: CHICAGO

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

RESULTS···YOUR CUSTOMER *pays for them···the* hiJet *assures them*

For the economical distribution of heat in
Factories
Railroad Shops
Roundhouses
Warehouses
Mills
Garages
Gymnasiums
and all industrial buildings, as well as in special process rooms where uniform heat maintenance is required.

ONCE a user always a user—speaks for the dependable and economical heating results made possible by the Herman Nelson hiJet Heater.

The hiJet's sales success is the result of RESULTS.

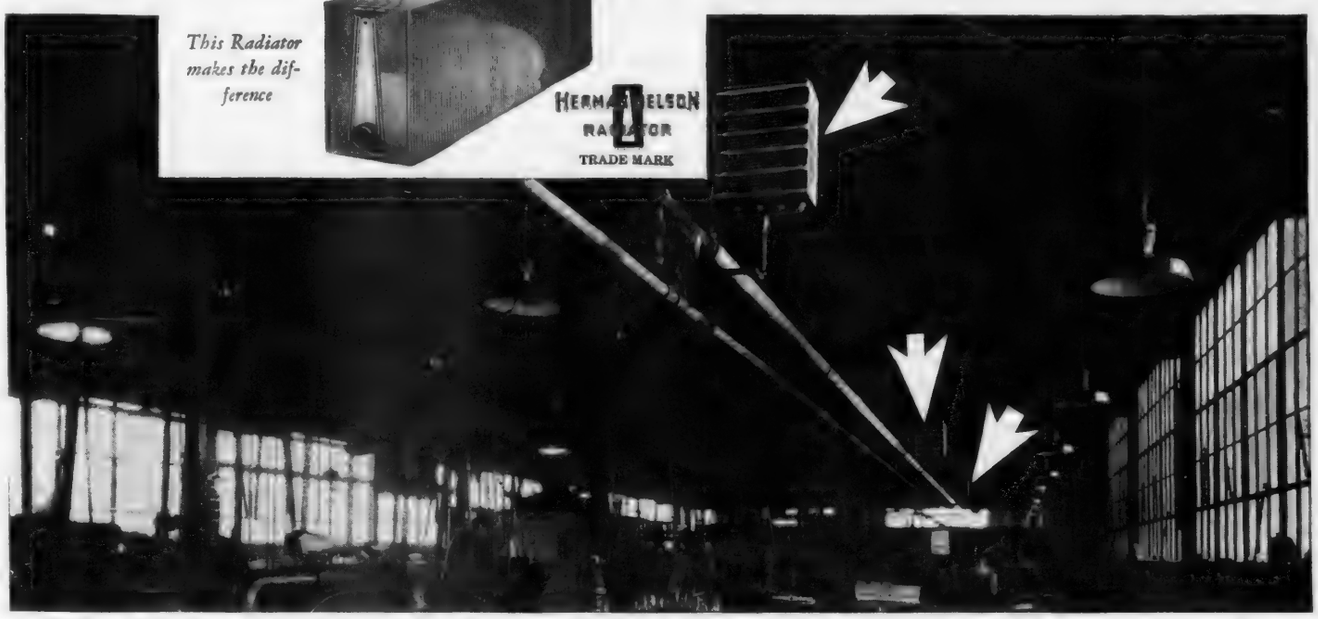
Its heating element is the Herman Nelson Radiator free of all brazed, welded, soldered or expanded joints to fail or leak in service. Operating steam pressures from 1 to 150 lbs.

A specially designed motor, the Her-Nel-Co, permits simple speed control with minimum running current.

In operation the hiJet directs a high velocity jet of warm air downward, dispelling the cold air strata at the floor line—resulting in an even comfortable temperature.

The hiJet is made in three sizes—all easy to install.

Before selecting heaters for your next heating job, get all the facts about the hiJet. Mail coupon for catalog.



Pontiac Pattern and Engineering Company, Pontiac, Michigan

Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*
Builders of Successful Heating and Ventilating Equipment Exclusively

Sales and Service

BELFAST, ME.	CHARLOTTE, N. C.	MILWAUKEE	EMPORIA
BOSTON	GRAND RAPIDS	GREEN BAY	KANSAS CITY
SPRINGFIELD	SAGINAW	MINNEAPOLIS	TULSA
PROVIDENCE	FLINT	DULUTH	DENVER
NEW YORK CITY	DETROIT	ST. LOUIS	SALT LAKE CITY
SYRACUSE	CLEVELAND	BIRMINGHAM	SPOKANE
BUFFALO	COLUMBUS	ATLANTA	PORTLAND
PHILADELPHIA	CINCINNATI	NEW ORLEANS	SEATTLE
SCRANTON	TOLEDO	MEMPHIS	SAN FRANCISCO
HARRISBURG	INDIANAPOLIS	LOUISVILLE	VANCOUVER
PITTSBURGH	CHICAGO	DALLAS	TORONTO
JOHNSTOWN, PA.	DES MOINES	OMAHA	WINNIPEG, MAN.
WASHINGTON, D. C.			CALGARY

The HERMAN NELSON hiJet TRADE MARK HEATER

GET FREE BOOK

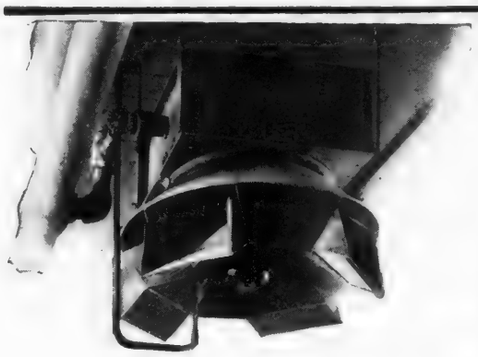
THE HERMAN NELSON CORPORATION
Moline, Illinois

Gentlemen:
Please send me book No. 12 containing the facts about Herman Nelson hiJet Heater.

Name..... *Firm Name*.....

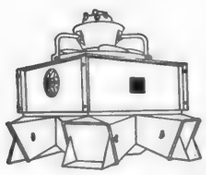
Address..... *Type of Building*.....

WING FEATHERWEIGHT

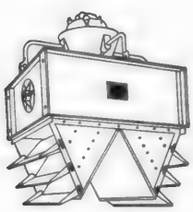


Type LC unit for installation close to ceiling—widespread discharge from low levels. Also used with fresh air duct.

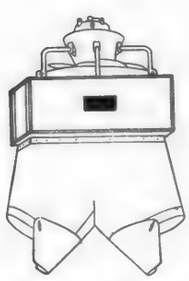
Special Discharges SPREAD warmth in a Wing Heated Building



Widespread discharge in all directions.



For small Heaters placed fairly low. Long narrow areas.



For high locations. Long, narrow areas.

CREATING currents of warm air by means of a fan and heating element is only the first step in heating a building effectively with unit heaters. The second step is to deflect this current so that it will spread through the cooler air in the building.

The success of Wing Featherweight Unit Heaters is due to the thoroughness with which they do this job of distributing the air they heat. This is accomplished by using a variety of standard discharges designed to deflect the air currents at the proper angle for various heights from the floor in any type of structure.

Wing Units work from directly over the area to be heated so they can discharge downward in all directions.

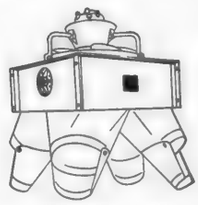
They are light enough to be placed just where they will distribute their heat most effectively.

They use the highly efficient Wing Scruplex propeller-type Fan to provide a sufficient volume and velocity of discharge to penetrate and warm the mass of cool air beneath it.

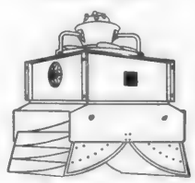
Graphic data on Wing Units and their installation in various types of buildings is given in our new illustrated catalog. Send for it.

L. J. WING MFG. CO.

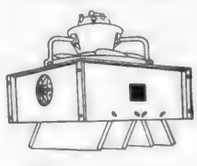
156 West 14th Street New York City, N. Y.



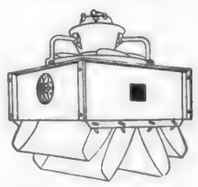
Moderate heights. Square areas.



Moderately low. Long, narrow areas.



For high locations over oblong areas.

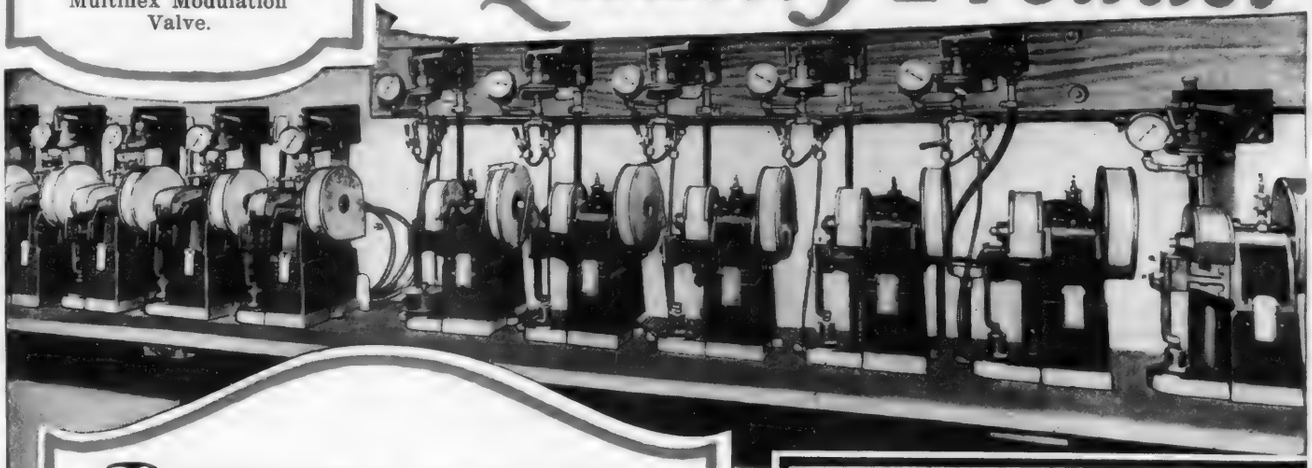


Moderately low. Long narrow areas.

UNIT HEATERS

Sectional view Special Multiflex Modulation Valve.

Safeguards to insure a Quality Product

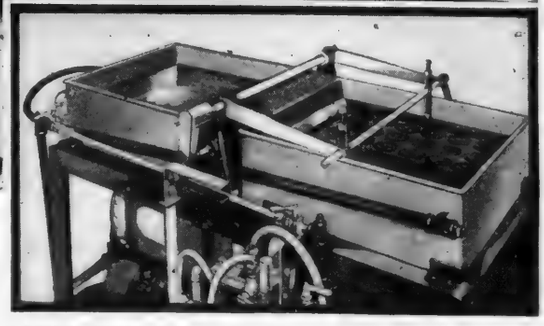


RECIPROCATING plungers in the above machines operating at 300 strokes per minute test sample lots of bellows day and night through many thousands of cycles in excess of the required life limits for which the bellows is to be used, operating them through the movement that they receive in actual practice and under internal pressure conditions of the apparatus in which they are used.

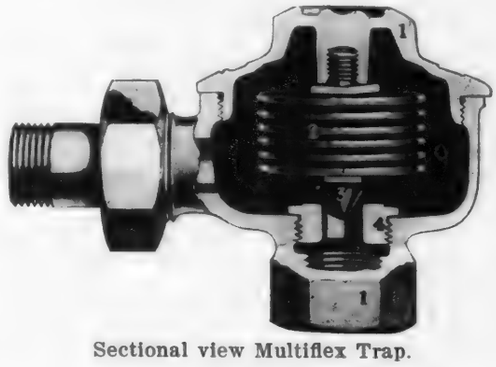
Automatic switches and counters record the final life limit by stopping the motor automatically when the internal pressure is removed from the bellows by failure.

Further life tests are conducted by immersion of the finished product at the rate of 225 cycles per hour in hot and cold water alternately for periods far in excess of the requirements for which they are used.

The wide-spread use of Bishop and Babcock Heating Specialties by the trade indicates an appreciation of our stringent efforts to maintain our quality beyond question and to constantly improve our product.



ABOVE—Charged bellows assemblies immersed alternately in hot and cold water.



Sectional view Multiflex Trap.

The BISHOP & BABCOCK SALES CO.

4901 ~ 4915 HAMILTON AVE., N.E. ~~~ *Cleveland, Ohio*

OFFICES IN PRINCIPAL CITIES

Skinner Brothers have had

longer, more varied experience than anyone else in applying unit heating

SKINNER engineers *originated* the Unit Method of Heating over 34 years ago. They have adapted it to thousands of open-space buildings of every structural type. They have studied and solved every imaginable kind of heating problem. Naturally such volume and variety of experiences have fitted them to plan the most effective heating even for the hardest-to-heat buildings.

The Unit Method of Heating is accepted as the best for open space buildings

The Skinner Brothers Method does not merely bring heat into the room and then let it float up into the unused space overhead. Fans in the units hold the heated air down where the workers need it and, by constant recirculation, diffuse warmth evenly over the entire room.

Skinner's Choice of Heaters for your building is in no way restricted

Making *all types* of unit heaters—floor type or suspended, steam or direct fired, prime or extended-surface coils—Skinner Brothers are in position to always recommend *the type* which *best fits your building.*

Recognizing these facts, you will know *why you cannot afford to plan heating without calling in a Skinner Man.*

Skinner Bros. Air Heaters

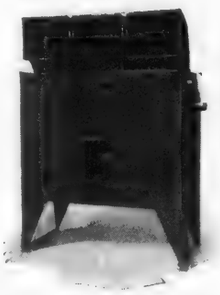
SKINNER BROTHERS MANUFACTURING COMPANY, INC.
1470 VANDEVENTER AVENUE, ST. LOUIS, MO.
BRANCHES IN ALL PRINCIPAL CITIES

There is a Skinner Air Heater to fit the heating needs of every type of open-space building

Skinner Bros. "Baetz Patent" Air Heater

Skinner Bros. Patented Direct-Fired Air Heater

Skinner Bros. Patented "Lightweight" Air Heater



Skinner Bros. Type "U" Air Heater

Notre Dame Academy, Tynesborough, Mass.
Architect: Edward T. P. Graham, Boston
Heating and Ventilating Engineers. J. E. Carroll
Company, Lowell, Mass.

A BEAUTIFUL SCHOOL

. . . WELL HEATED
. . . WELL VENTILATED
. . . FREE FROM DRAFTS

The Notre Dame Academy at Tynesborough, Mass., provides a good example of the economy and comfort of Unit Heater-Ventilators in school work.

In this stately building Sturtevant Unit Heater-Ventilators provide a particularly satisfactory air condition all the year 'round.

These units draw in—from out-of-doors—controlled quantities of air; filter it clean; warm it to the desired temperature and introduce it into the classrooms noiselessly, safely—without the hint of a draft.

Sturtevant Unit Heater-Ventilators are compact, handsome in appearance and SILENT. They can be used in old and new buildings—no expensive duct work necessary.

It would be a pleasure to send you a new Data-Catalog showing many actual installations in schools, public buildings, clubs, churches, offices, showrooms, shops and residences. It is a helpful book . . . our nearest Branch Office will gladly mail you a copy.

B. F. STURTEVANT COMPANY

Plants and Offices: Berkeley, Cal. ◥ Camden, N. J. ◥ Framingham, Mass. Galt, Ontario ◥ Hyde Park, Mass. ◥ Sturtevant, Wis.

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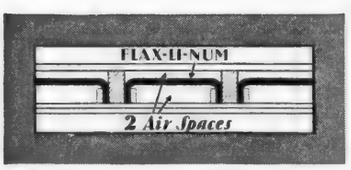
Sturtevant *the Silent* Unit Heater-Ventilator

Reg. U. S. Pat. Off.

SUPPLIES OUTDOOR AIR FILTERED CLEAN AND TEMPERED

the ADDITIONAL *air space provided by the* Flax-li-num *method of insulation*

. . . Makes practical the Use of an Economical Thickness of Material for MAXIMUM PROTECTION



THE FLAX-LI-NUM method of insulating automatically provides two air spaces in the wall. It forms a wall-within-a-wall. In this way an additional air space is provided over other types of application . . . The division of the air space within the wall increases the insulating value of the material.

According to the U. S. Bureau of Standards Letter Circular No. 227, "the insulating value of an ordinary air space more than about one inch in width is equivalent to about ¼ inch of insulating material". Obviously then, when installed according to the "two-air-space" method, FLAX-LI-NUM gives the maximum protection from an economical thickness of material. It increases its own efficiency at least 50%.

In no other way can such effective results be accomplished . . For FLAX-LI-NUM not only protects with its own high insulating value, but in addition, provides the extra protection of an additional layer of air. Let us send you a copy of the new FLAX-LI-NUM Manual, containing valuable reference information. A copy should be in every file.

FLAX-LI-NUM INSULATING CO., *St. Paul, Minn.*

FLAX-LI-NUM INSULATING COMPANY, HV-9
St. Paul, Minnesota

Send me complete information about Flax-li-num.
Also facts about the "two-air-space" method.

Name.....

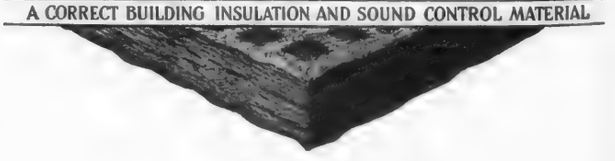
Address.....

City.....

State.....

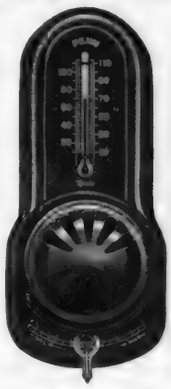
Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



FOR HOMES *you serve and* WANT *to* SATISFY

WHEN you recommend and install the new Penn Thermostat Control for oil burners, you are assured that you have served and satisfied. For the unique simplicity of this better controlling device eliminates much of the expense and time both in installation and servicing. Embodying the exclusive Penn Magnet contacts, it ends forever the fuss of fragile tubes and complicated hook-ups. Supremely sensitive (two degrees differential), constant accuracy, and harmonious appointment are a few of the superior sales advantages it offers you. Supplied complete, ready for installation, and priced comparable to other makes. Unconditionally guaranteed. You are invited to test it at our expense. Write today.

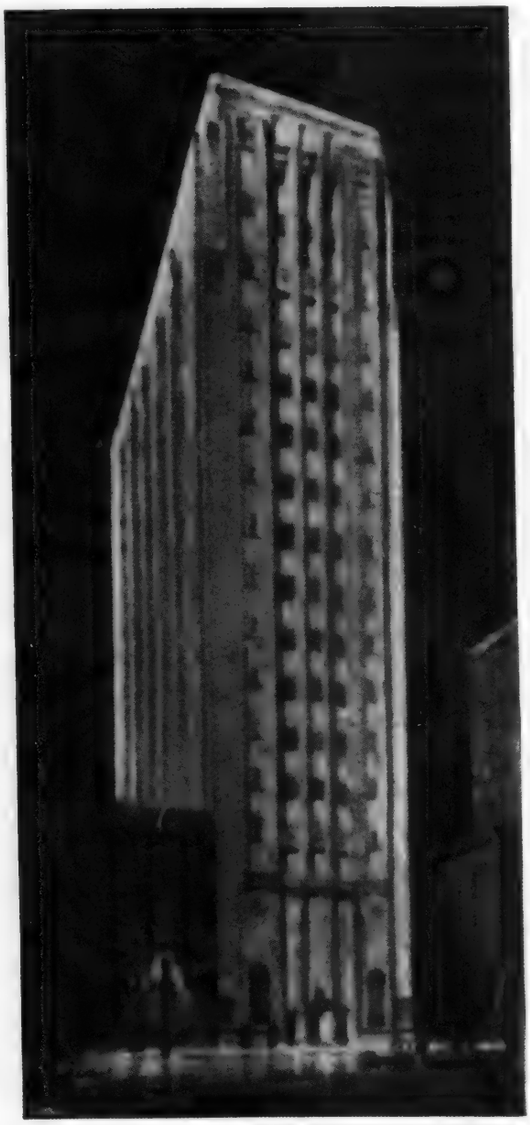


PENN ELECTRIC SWITCH CO.

DES MOINES, IA.

A Complete Line of
Automatic Electric
Switches for
Oil Burners
Pumps
Refrigerators

Air Compressors
Thermostatic Switches
Float Switches
Unloader Pilots
Vacuum Switches
Pressure Switches



Chicago Motor Club, Chicago—Hardinge Installation

Another of Chicago's splendid new club buildings equipped with the Hardinge oil burner

Heating and Ventilating engineers can point to prominent buildings in every big city that are being efficiently and economically heated with the Hardinge Fuel Oil Burner. Precision-built in 12 distinct sizes, including a specially priced burner for the small-sized home and apartment, the Hardinge line of fuel oil burners offers a specific model for every heating need from bungalow to skyscraper. You are specifying 10 years of *absolutely guaranteed* oil heating efficiency when you recommend the Hardinge Fuel Oil Burner. Write us for literature fully describing this quiet, economical and completely automatic oil burner.

Hardinge Brothers, Inc.

Factory and General Offices

4149 Ravenswood Avenue
Chicago, Ill.

Electric Ignition Available On All Models If Desirable

HARDINGE
FUEL OIL HEAT

a pencil

SAVES HUNDREDS OF DOLLARS . . . .

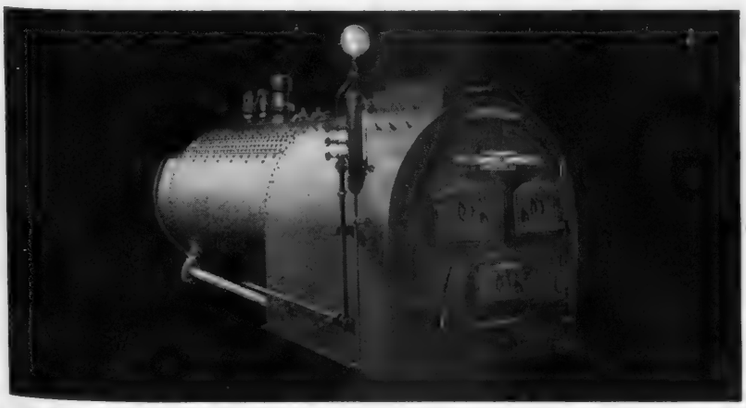
WRITE . . . fill out the coupon in the lower corner . . . takes but a few seconds of your time . . . AND you will find that a mere pencil has saved you HUNDREDS of dollars!

We have a bulletin of information about the famous Stanwood Smokeless Boiler. This bulletin is No. 500. If you will but write for it, you will receive an answer to your boiler problem.

We created the Stanwood Smokeless Boiler. We built it to answer especially the demand for a super-efficient heating and power boiler. Any engineer who neglects investigation of the Stanwood, is simply refusing his client the opportunity to save big money on operating expenses.

We also build horizontal tubular boilers as well as other standard types. We have been in business since 1891 . . . making boilers. The Stanwood Corporation, Cincinnati, Ohio. Stanwood Smokeless Boilers are steel riveted and are built in sizes from 29 to 250 H.P. for working pressures of 15, 100, 125 and 150 lbs.

STANWOOD SMOKELESS BOILERS.



THE STANWOOD CORPORATION,
Department D-99, Cincinnati, Ohio.

Gentlemen:....I want Bulletin No. 500 ..... give me complete information about the famous Stanwood Smokeless Boiler.

Name.....

Address.....

City.....State.....

Interested in a boiler of.....horsepower.....pressure.

21 Stories of HOT WATER

Furnished This Apartment by

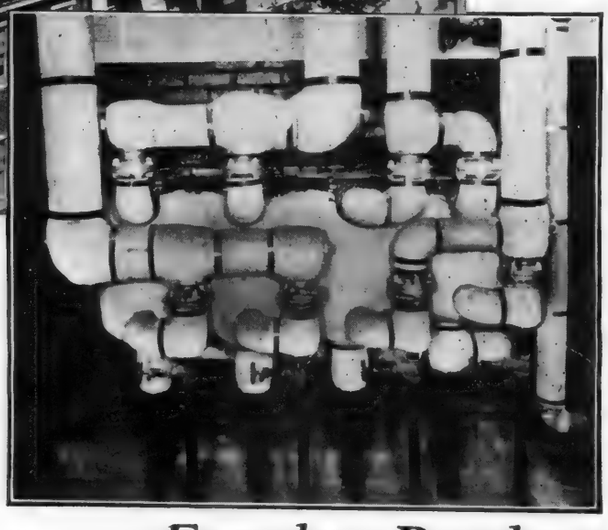
EXCELSO INDIRECT **WATER HEATERS**

What a Saving!

. . . every family in this huge apartment house supplied hot water of correct temperature, with the *care and cost of separate heater for hot water eliminated.*

Four heavy duty, removable copper coil Excelso Water Heaters (in battery), connected to the steam boiler, take care of all domestic hot water needs at lowest possible cost.

Over 700,000 successful installations in residences, apartments, hotels, office and mercantile buildings. Write for catalog showing fourteen typical and tested Excelso installations. There is no substitute for Excelso in design or efficiency.



2031 Locust St. Apartment, Philadelphia.

Architects:
McIlvain & Roberts.
Heating Contractor:
A. McClintock & Sons.
Plumbing Contractor:
Wm. Newell & Sons.
Heating System:
Vapor Engineering Co.

Excelso Products Corporation

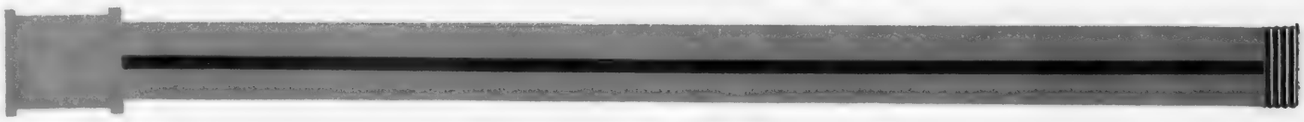
DIVISION OF AMERICAN RADIATOR COMPANY

59 Clyde Avenue BUFFALO, N. Y.

SIZES TO HEAT WATER FOR ONE FAMILY OR ONE HUNDRED FAMILIES

ARCO METAL PIPE

SEAMLESS CAST IRON



FLEXIBLE CORROSION RESISTING

PHOTOGRAPH shows a portion of the 1600 feet of 4" Arco Metal Pipe installed in the Highland Park Cemetery at Cleveland, Ohio. This clearly demonstrates the remarkable adaptability of Arco Metal Pipe for buried lines. Note unusual flexibility.

Arco Metal Pipe, although made of a special analysis nichrome alloy cast iron and possessing all the corrosion-resisting qualities of cast iron, has overcome many of the limitations heretofore associated with cast iron. The development of Arco Metal Pipe is really revolutionary for this remarkable pipe is not only flexible but can be cut and threaded on the job with the same tools used to work wrought steel and iron pipe and can be made up tightly with screw threaded couplings and fittings.

Write today for complete information. Send this coupon for all mechanical data on this remarkable pipe.

ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO

AMERICAN RADIATOR COMPANY

ARCO METAL PIPE DIVISION
40 WEST 40th STREET, NEW YORK

DEPT. 1

*Name*_____

*Address*_____

*City*_____ *State*_____

BETTER READ THIS TWICE:

SIT down in a chair within a few inches of the Improved Challenger KLEEN-HEET. Listen as carefully as you can. Try to tell whether or not it is in operation. Despite all your oil burner experience you'll find it almost impossible to tell! Put a sleeping child down beside the operating burner! The child will not be awakened by the burner. Let a very nervous person try it. There will be no reaction. Because this remarkable oil burner is silent—not just "quiet," but silent, and without vibration of any kind. Sales of the IMPROVED CHALLENGER, made by this test, are breaking all past records.

"CLOSE-UP" TEST HITTING LIKE A SLEDGE-HAMMER!

YOU haven't run across anything like this in your previous oil burner experience. A real "Close Up" test that is creating more enthusiasm than anything of the past. It is **simplifying** and **multiplying** sales for every KLEEN-HEET dealer using it.

We have always admitted, and always shall, that there are other good oil burners — that any good oil burner is infinitely better than coal heat.

But this development — the IMPROVED CHALLENGER KLEEN-HEET — **takes its place with the greatest advances in our industry's history. On price, performance, and every other count, it is one of the great burners of all time.**

Specially designed and built for homes of average size or smaller. The simplest automatic oil burner ever built. It reduces installation costs at least 15% below anything you have known in the past. It cuts down servicing-responsibility or servicing-need phenomenally.

Opening an entirely new field of sales-opportunity, it increases your NET-PROFIT **opportunity at the same time.**

You'll probably **want** to know all about it, and you certainly **ought** to know all about it. We're prepared to provide all the facts, upon your request. We'll have about all we can do to take care of our present dealers, immediately, but **this information has real value for anyone who intends to stay in the oil burner business and make real money in it.** Write today. WINSLOW BOILER AND ENGINEERING COMPANY, 844 Rush St., Chicago.

IMPROVED CHALLENGER

Kleen-Heet

MODEL DO-1 (Small Warm Air Furnaces)
MODEL DO-2 (Large Warm Air Furnaces)
MODEL D-1 (Small Boilers, Large Furnaces)
MODEL D-2 (Large Domestic Installations)
MODEL D-3 (Commercial and Large Domestic)
MODEL D-3P (For Commercial Installations)
MODEL M-1 (Full Automatic Industrial 5,000 sq. ft.)
MODEL M-2 (Full Automatic Industrial 10,000 sq. ft.)
MODEL M-3 (Full Automatic Industrial 15,000 sq. ft.)
MODEL M-4 (Full Automatic Industrial 20,000 sq. ft.)
MEMBER OIL HEATING INSTITUTE
OIL HEAT AS DEPENDABLE AS SUNSHINE

HART OIL HEAT

Why Are Dealers Daily Switching to the Preferred-Hart?

There are several reasons. First, they find here sincere, sympathetic, helpful co-operation; that dealer success comes first; where "quota" means buying right to sell at a profit—not at a price.

Second, they find here a complete line (ten fully automatic models) that conquer every oil burner need (from the smallest hot air furnace to 150 h. p. boiler industrial installations.)

Third, exclusive territory, liberal advertising allowances and the fairest, squarest dealer deal ever written for the retail burner business—all backed by a half million dollar concern adequately financed to make good on every dealer and consumer promise.

If you are searching for permanence, with a liberal return on your investment and energy, if you want to join us in a stable, lasting, profitable business development—then you will send to us for the balance of this advertisement.

Type DO—For Small Homes and Cottages

Made in two sizes and designed especially for warm air installations, small round boilers and Arcolas. Fully automatic; needs no fan for perfect combustion. Low in first cost, economical and quiet in operation. Simple, easy to install. Only one pipe line needed. Only fourteen standard brick required in the combustion chamber; grates are left in place. Only three wires to run. Burns all fuel oils down to 28-30 degree Baume. Approved by Underwriters' Laboratories.

Type D—For Larger Homes and Apartments

Made in four sizes to accommodate from 900 to 4,000 square feet steam radiation, or its equivalent. Completely automatic and equipped with every necessary device for efficiency and safety. All working parts self-oiled and with Preferred-Hart's exclusive features, including self-cleaning spark points, triple atomization, vacuum control and others, service work is practically ended.

Type M—For Industrial Installations

Made in four sizes to accommodate from 5,000 to 20,000 square feet steam radiation. Probably the only fully automatic industrial oil burner on the market today. Dual electric ignition. Nozzles are in horizontal line, spreading a flat flame over the entire grate area, assuring efficient combustion. These models round out the Preferred-Hart line to include heavy duty commercial and industrial installations.

Retail Sales and Advertising Helps

In April alone one distributor sold at retail 971 Preferred-Hart Oil Burners. This proves not only the salability of this complete line but proves, too, that Preferred-Hart sales aids and advertising helps form a sincere co-operation unsurpassed in results. Liberal allowances are made for local retail newspaper advertising. Direct mail literature is sent out to prospect lists at factory expense. We have just completed the mailing of a half million pieces of direct mail literature (twelve different numbers) to dealer lists. The resulting sales were exceedingly gratifying to every co-operating Preferred-Hart dealer.

Complete Line—10 Models

Model No.	*Capacity	List Price
DO-1	350 sq. ft. steam rad. 450 sq. in. w. a. d. a.	$
DO-2	600 sq. ft. steam rad. 750 sq. in. w. a. d. a.	
D-1	900 sq. ft. steam rad.	
D-2	2,000 sq. ft. steam rad.	
D-3	3,000 sq. ft. steam rad.	
D3P	4,000 sq. ft. steam rad.	
M-1	5,000 sq. ft. steam	
M-2	10,000 sq. ft. ste	
M-3	15,000 sq. ft. s	
M-4	20,000 sq. ft.	

*Steam Rad. means steam radiation

Dealer Discounts

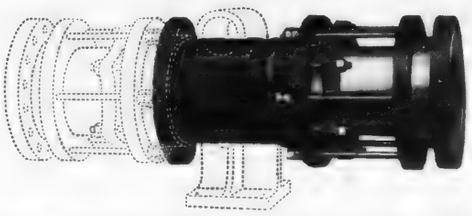
Our discounts are based on what we sell

PREFERR

Memo-write Preferred Oil Burners, Inc., Peoria, Illinois for the corner torn off this advertisement —is this territory open?

Specialists in District Heating

Equipment for Underground Steam Lines



ADSCO SEMI-GUIDED EXPANSION JOINT WITH TIE RODS

For 4, 6, 8, 10 and 12" traverse, 125 and 250 lbs. pressure. Extensively used in high and low pressure lines where external guide is not required.

Ask American Car and Foundry Which Expansion Joint to Use

Doubtless, before they specified ADSCO Expansion Joints, the American Car and Foundry Company checked past performance and quickly uncovered those many instances where ADSCO Expansion Joints had been buried underground for 10 to 20 years without attention and were still functioning perfectly.

Then their investigation must have brought to light the excellence of ADSCO design—the carefully worked out guiding methods—machined and polished slips—the ample-stuffing boxes—all of which insure ease of movement and absence of undue strain in the line.

And for adaptability ... ADSCO provides a complete range of sizes and styles for every condition of pressure and temperature—for steam, oil, gas, water and every liquid conveyable by pipe line.

For complete information send for the ADSCO Reference Book on Expansion and Contraction in Pipe Lines. Just mail the coupon below.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA, N.Y.

"50 YEARS IN BUSINESS"

to be sure of getting

ADSCO

EXPANSION JOINTS

Order Direct

The First Step is to get this BOOK

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N.Y.

Please send me free your new book "Reference Data on Expansion in Pipe Lines."

Name.....

Position.....

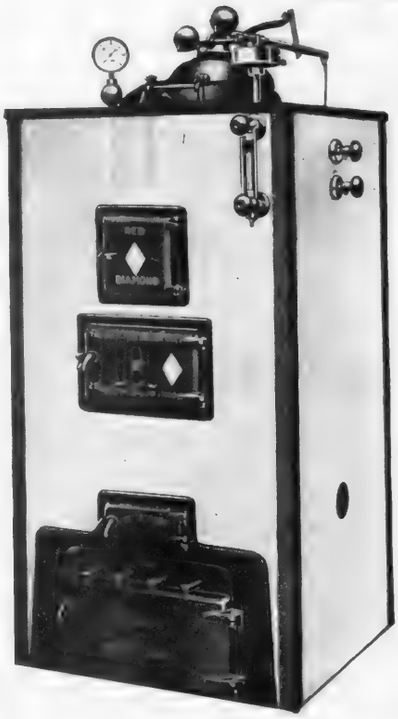
Company.....

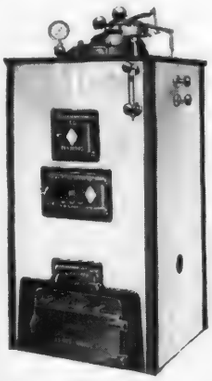
Address.....H.V.-9

ACE of Jacketed Boilers

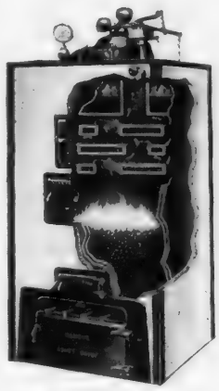
Volunteer Boiler

Volunteer (Cutaway)

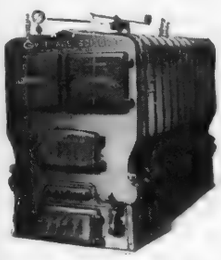




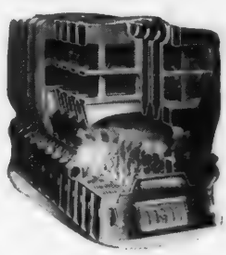
Red Diamond Boiler



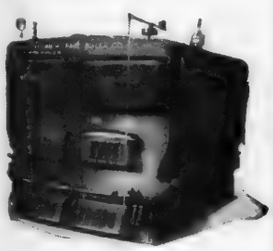
Red Diamond (Cutaway)



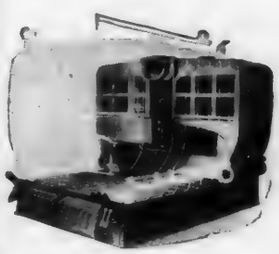
Monarch 40″ Boiler



Monarch 40″ (Cutaway)



Monarch 60″ Boiler



Monarch 60″ (Cutaway)

The Page Red Diamond Boiler is thoroughly modern in its dapper, colorful jacket of red enamel—it appeals immediately to the householder—yet it is not a new and untried product.

Underneath its snappy jacket is the Page Round Boiler (Volunteer) tried and proven by 70 years on the job—your assurance that friend householder will be comfortably warm all winter, and his fuel cost will be low.

For other and larger jobs, Page gives you a wide choice of sizes and capacities, each one a good buy, more grate area—more heating surface—more boiler for every dollar expended. See our Catalogue No. 55.

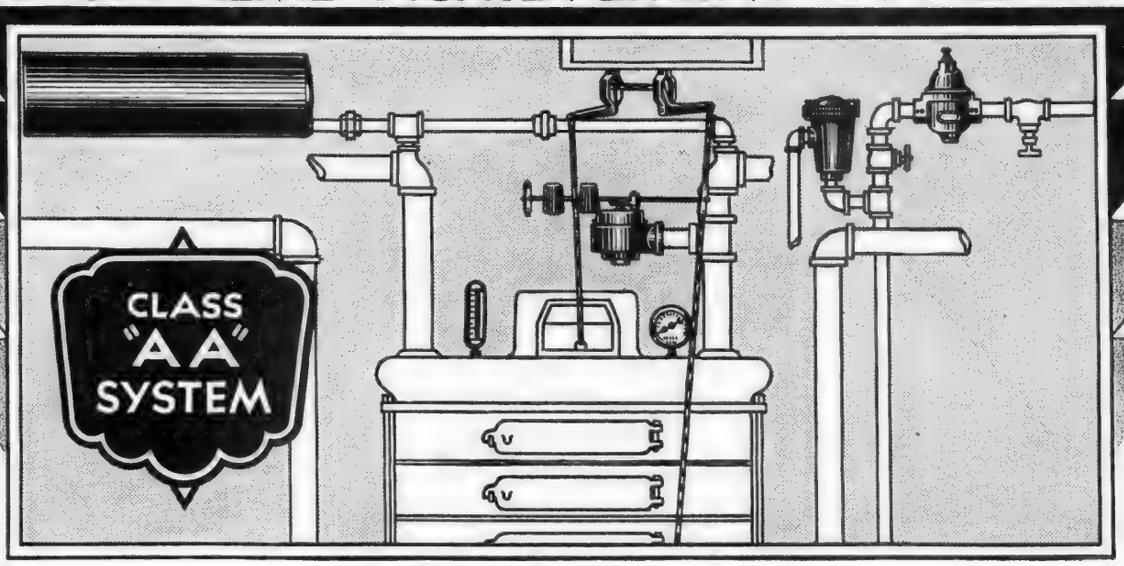
The Wm H Page Boiler Co

Investigate and you, too, will recommend Page

200 MADISON AVENUE, NEW YORK, N. Y.

Boston Philadelphia Cleveland Meadville, Pa.

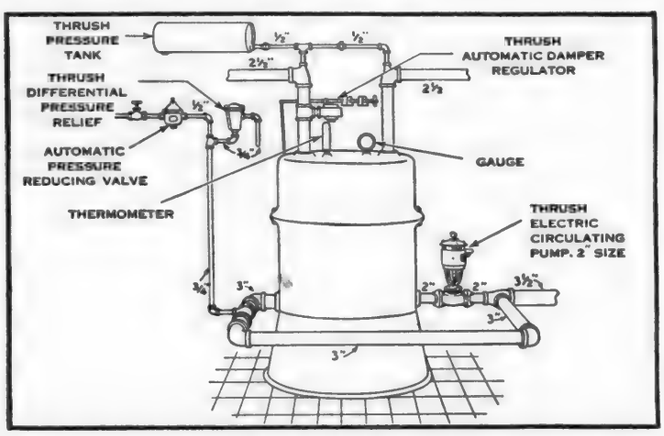
THE SUPREME ACHIEVEMENT IN HEATING

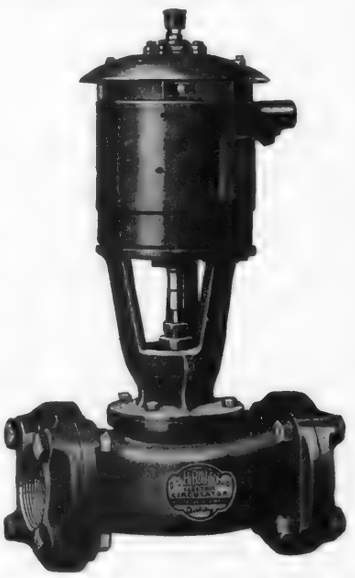


Greater Efficiency for Oil Burning

HOT WATER HEATING JOBS!

THRUSH System and the Thrush Electric Circulating Pump applied to oil burning Hot Water Heating Plants will greatly increase comfort and convenience and *save 20% to 30% of fuel consumed.* Get the facts now. Let Thrush Engineers help you design better installations or cure trouble jobs. *Tell us your problems.*





The Thrush Electric Water Circulating Pump

A Thrush forced circulating Hot Water Heating Plant costs less to install than vapor or two piped steam jobs. Has greater flexibility to meet changing weather conditions.

Maintenance cost lower than any method of heating known. No troublesome air valves or traps. Absolutely noiseless.

H. A. Thrush & Co.

Department A

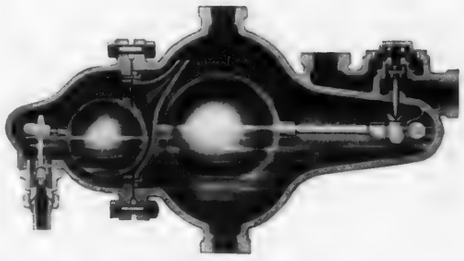
Peru, Indiana

THRUSH ELECTRIC CIRCULATOR AND

THRUSH SYSTEM

OF HOT WATER HEATING

McALEAR



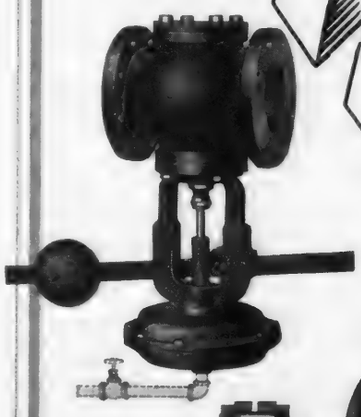
You can have McALEAR Quality in all your Pressure and Level Control Equipment

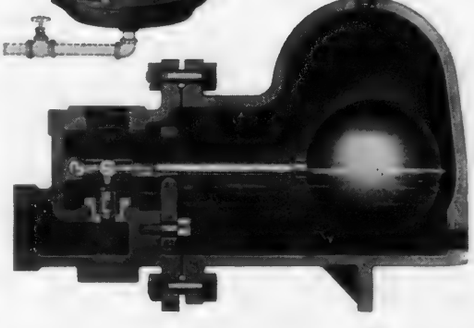
Maybe you are one of the many thousands who have standardized on a certain McAlear Product because its performance so definitely proved its superiority. With you, it might have been our water feeder; with some one else, our steam traps, pressure regulating valve or strainer.

But — do you realize that the same satisfaction that was yours on ONE item was duplicated by other users on other McAlear Products? All are designed and tested by the same engineers—all carry the benefits of our 25 years of intimate, specialized experience—all are made in the same plant with the same standards and backed by the same broad guarantee of satisfaction.

The McAlear line is NOT a one item line but includes quality equipment to meet every pressure and level control condition.

THINK of McAlear as a complete line. Write for our text book with its 128 pages of illustrations, installations, blue prints, diagrams and charts. There's a copy waiting for you. WRITE FOR IT AND SPECIFY McALEAR.



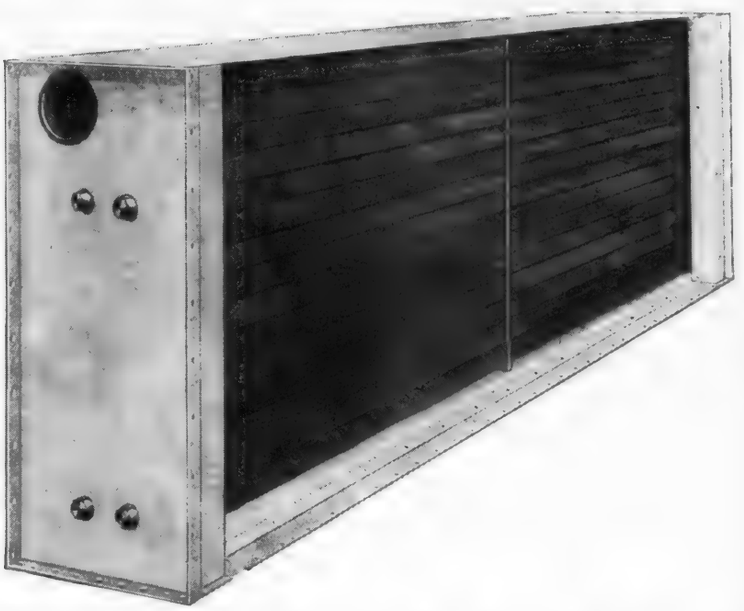


THE McALEAR MFG. CO.

1905 S. Western Ave. -:- Chicago, Ill.

McALEAR

ENCASED ARCOBLAST



HEATERS

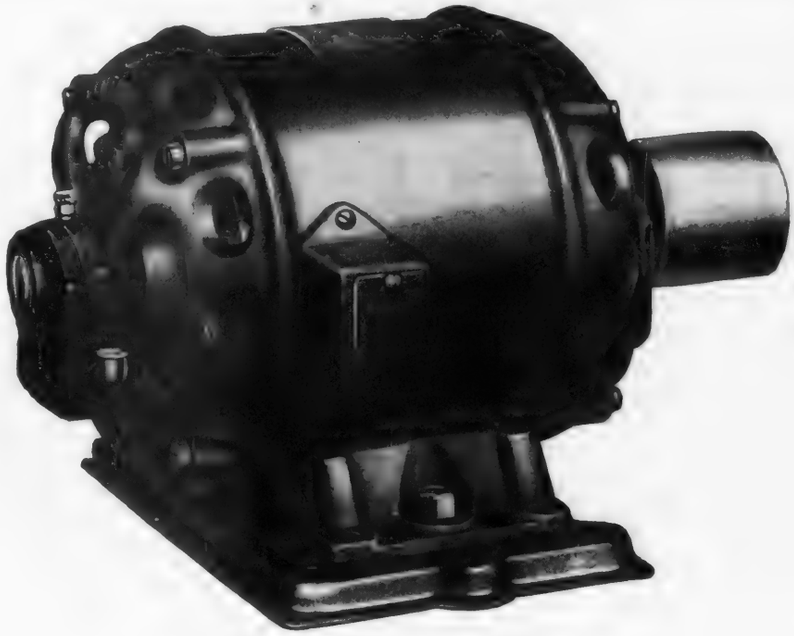
THE Engineer figuring on a light weight heating surface for central fan or plenum chamber work will find Encased Arcoblast capable of meeting every requirement.

Here are the outstanding features of Encased Arcoblast—GALVANIZED ENCASEMENT—complete and ready for shipment. NO SOLDERED STEAM-BACKED JOINTS—Tubes expanded in headers—Insured strength for high pressure. NON-CORROSIVE—Heating surface entirely non-ferrous metal. ASSURED STRENGTH WITH MINIMUM WEIGHT—Staggered rows of copper tubes expanded into cast iron headers.

Write today for complete engineer's data.

AMERICAN RADIATOR COMPANY

816 South Michigan Avenue, Chicago 40 West 40th Street, New York



¼ Horse Power Century Type RS
Repulsion Start Induction Single Phase Motor

Electric Refrigerators Oil Burners

REFRIGERATORS and oil burners are more exacting service than most installations. Century Single Phase Motors were particularly suited to this severe service long before these commercial and domestic appliances were popularized. Century Single Phase Motors have the proper starting and operating characteristics, they resist dampness, are quiet in operation, require the very minimum of attention and "Keep a-Running".

Built in Standard sizes from 1/8 to 40 horse power. Temperature rating, 40° C.

CENTURY ELECTRIC CO.

1806 Pine St. St. Louis, Mo.

40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

Century MOTORS

"THEY KEEP A-RUNNING"

As substantial as it looks!

HOTEL GOVERNOR CLINTON
New York City

Architect, Murgatroyd & Ogden, New York City
General Contractor, Thompson-Starrett Co., New York City
Heating and Ventilating Engineers, Jaros & Baum, New York City
Plumbing Contractor, Frank B. Lasette, Inc., Long Island City, N. Y
Heating Contractor, Thompson-Starrett Co., New York City

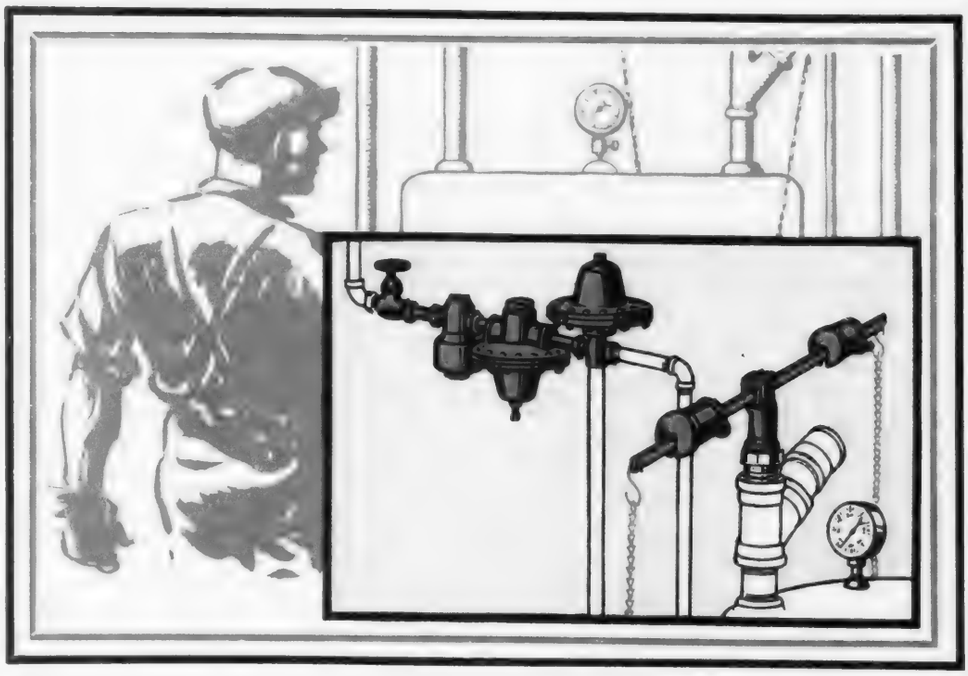
AT Seventh Avenue and Thirty-First Street, New York, another triumph in hotel construction has recently been completed. Rising thirty-one stories above the ground, the Hotel Governor Clinton majestically salutes the sky—a magnificent combination of beauty and stability in hotel construction. Here, master architects and engineers have translated their ideals into enduring realities . . . another evidence that modern architecture aims at permanence as well as attractiveness.

The graceful exterior lines of this latest addition to New York's fine hotels are symbolic of the care and skill applied to the interior plan and specification of materials—that it might truly be . . . as substantial as it looks . . . within and without.

Each and every item on the specification list was subjected to the closest scrutiny. There could be no compromise with quality here—no substitute for proved dependability—endurance was foremost in consideration. And when it came to the piping—one of the most important items in a building of this type—NATIONAL was specified for the major pipe tonnage.

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL PIPE



Confidence plays a part

More heat—less fuel—space conservation—automatic regulation—these are all valid arguments in favor of Mueller Automatic Control for hot water plants. Yet there is another factor—strong, convincing—that makes the sale of the Mueller System easier and more profitable for heating contractors.

Confidence plays a part in selling this and all Mueller products—confidence in the Mueller reputation for quality and dependability. The Mueller name is well-known to engineer and layman alike. It has stood for the *best* in plumbing fittings for 72 years. *The Mueller name inspires confidence that makes selling easier.*

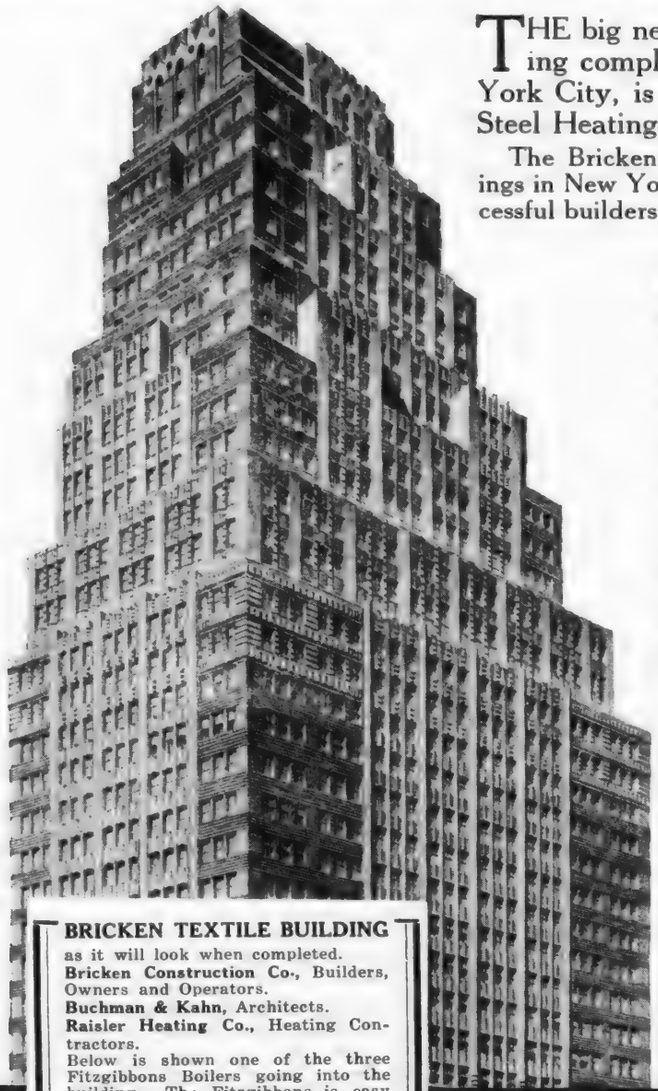
Mueller Automatic Controls are reasonably priced, easy to install, adaptable to large jobs and small. Your request will bring details—including information that will point the way to profitable business for you.

MUELLER CO. (Established 1857), Decatur, Illinois.
Branches: New York, Dallas, San Francisco, Los Angeles.
Canadian Factory: MUELLER, Limited, Sarnia.

MUELLER

AUTOMATIC HEAT CONTROL SYSTEM

Another big New York building makes sure of *efficient, economical heating*



BRICKEN TEXTILE BUILDING
as it will look when completed.
Bricken Construction Co., Builders, Owners and Operators.
Buchman & Kahn, Architects.
Raisler Heating Co., Heating Contractors.
Below is shown one of the three Fitzgibbons Boilers going into the building. The Fitzgibbons is easy to handle, even where New York's traffic is heaviest.

THE big new Bricken Textile Building, now rapidly nearing completion at 1441 Broadway, in the heart of New York City, is equipped with a battery of three Fitzgibbons Steel Heating Boilers.

The Bricken Construction Co. owns and operates many buildings in New York and ranks among the city's largest and most successful builders and operators.

Contributing to its success is the Company's policy always to supply efficient heating. And Bricken Buildings are noted for their excellent heating conditions.

Naturally, in such large scale operations, success depends not only upon providing satisfactory heating, but also upon producing it at lowest cost.

It is significant, therefore, that the Bricken Company has selected Fitzgibbons Boilers for a large majority of their buildings and for nearly all of those erected during the past 5 years.

The reasons why any Fitzgibbons-heated building is sure to have efficient heating at lowest cost, are found in the superior combustion and the faster and more efficient heat transfer which are the natural result of clearly defined scientific advantages of Fitzgibbons Boiler design.

These features of design and advantages, including the exceptionally quick "pick-up" of the heating load, are fully explained in the Fitzgibbons Boiler catalog. A copy will be mailed to you, promptly, upon request. Tell your secretary to write for it.

FITZGIBBONS BOILER CO., Inc.
570 Seventh Ave., New York, N. Y.
Works: Oswego, N. Y.

Branches and Representatives:

Baltimore	Boston	Philadelphia
Bridgeport	Buffalo	San Antonio
Detroit	Pittsfield	Reading
Pittsburgh	Richmond	Rochester
	Winston-Salem	Syracuse

FITZGIBBONS STEEL HEATING BOILERS

The HYDROLATOR Boosts

1. Hot Water Circulation

2. Fall Heating Profits

Put the same selling effort behind the HYDROLATOR which you spend on other plumbing and heating equipment and watch your sales and profits increase. The HYDROLATOR is easy to sell—*all* hot water systems are improved by it, and *some* won't work at all without it.

Cures "Sick" Hot Water Jobs

Make a note now to see every owner of a "sick" hot water job that you know about. Tell him about the HYDROLATOR and how it will eliminate hot water circulation trouble. You can sell nearly every one of such prospects—and we'll furnish you with all the literature you need.

Reduces Fuel Costs

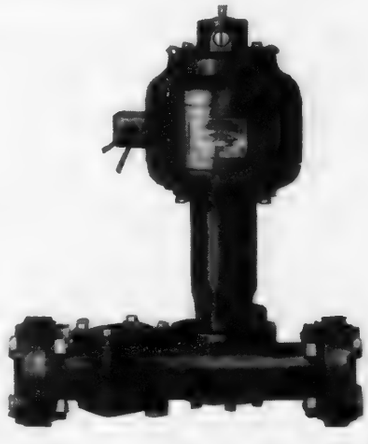
The HYDROLATOR stimulates circulation—drives the water through the system at increased speed. Thus, the greatest heat value is obtained from the fuel and less fuel is consumed.

Janette Manufacturing Company
556-558 West Monroe Street
Chicago

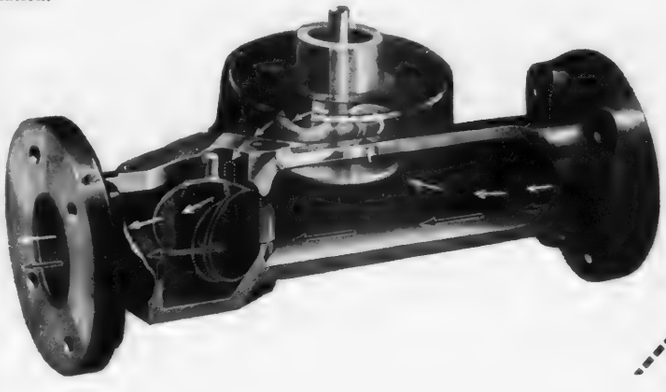
Singer Bldg., 149 Broadway, NEW YORK

Real Estate Trust Bldg., PHILADELPHIA

Distributors in Leading Cities



Cut-away view of HYDROLATOR showing *patented exclusive check-valve.* By means of this check-valve the HYDROLATOR secures a sufficient pressure differential between the inlet and the outlet sides to overcome abnormal restrictions to circulation.



Mail Coupon Today for Complete Information

JANETTE MANUFACTURING COMPANY Dept. H-9
556-58 W. Monroe St.,
Chicago, Ill.

Gentlemen:

You may send me full information on your HYDROLATOR including prices, installation, methods of control and discounts.

Company.....

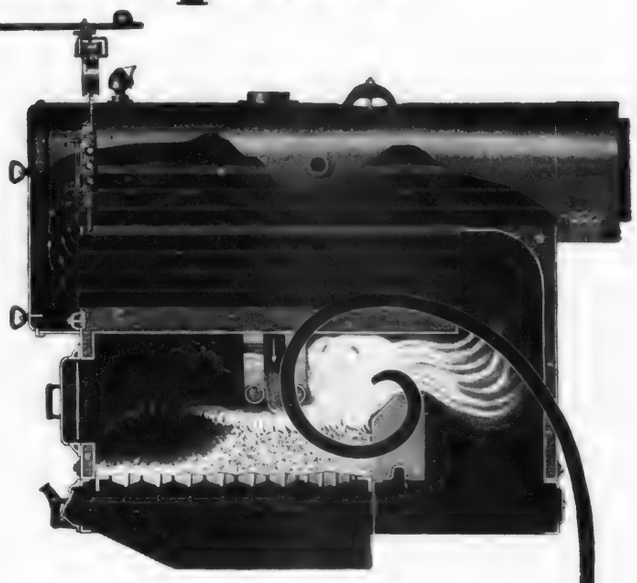
Address.....

City.....

State.....

By.....

No Smoke Passes This Whirlpool!

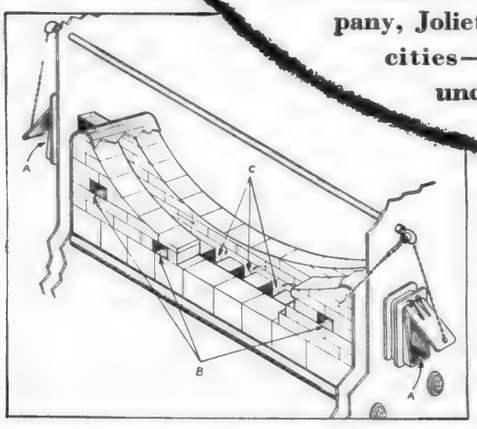


Like dry tinder—the soot laden gases of soft coal ignite the instant they strike this turbulent whirling mass of incandescent flame!

They burn and their usable heat units are utilized—because in this new Heggie-Simplex Smokeless Boiler there is always the right amount of oxygen to effect complete combustion. The additional oxygen necessary to burn bituminous coal smokelessly, but which can not be drawn through the fuel bed alone, is introduced through a special "carbureting chamber" over the fire.

Built of refractories, this chamber not only introduces the necessary additional oxygen but thoroughly heats it before passing it down onto the fire. A refractory bridge wall to the rear of this chamber baffles the fire, creating a whirlpool of flame which consumes all of the smoke and combustibles.

For complete facts, write Heggie-Simplex Boiler Company, Joliet, Ill.; representatives in principal cities—telephone and address listed under "Heggie-Simplex Boilers."

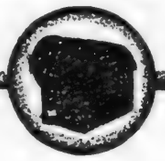


The "Carbureting Chamber" of the Heggie-Simplex Smokeless Boiler

Air is drawn in through intake doors (A) on both sides of the boiler. Volatiles arising from the fresh fuel are admitted through ports (B) in the forward wall. This inflammable mixture is thoroughly heated by the hot refractory walls of the chamber. It is ready for instant combustion when it passes through the jets (C) to mix with the gas stream flowing under the chamber.

Note there are no bothersome ceiling pulleys, long chains, etc. The operating device is "built in" the boiler.

HEGGIE-SIMPLEX
STEEL HEATING BOILERS



HEATING AND VENTILATING

formerly

The Heating and Ventilating Magazine

CONTENTS

SEPTEMBER 1929

Editorial 59
Heating and Ventilating a Large Air Transport *Frank Canney* 60
Elementary Fan Engineering *Charles A. Carpenter* 63
Coliseum Heating and Cooling Equipment *R. F. Taylor* 65
Space Heating With Gas *A. A. Blomfeldt* 68
A Survey of Window-Frame Construction *Alfred M. Lane* 72
Unusual Building Construction and Heating System *Peter H. Bryce, M.D.* 74
Universities and Schools in which Courses in Heating and Ventilating Are Included in the Curricula 76
New Organization Promotes Use of Anthracite 81
Additional Market Data—Domestic Oil Burners 83
Legal Decisions 84
Operating Data for Large Office Buildings 85
B.T.U. Club—Sounds and Vibration from Oil Burners 88
House-Heating a Feature of Tentative A.G.A. Program 90
The Biddle Plan 92
Correspondence 97
Glancing Backward—Pierce, Butler & Pierce Mfg. Corporation 99
Graphs and Charts 101
Present Practice in Water Heating—Mueller System 106
Standard Heating and Ventilating Data Sheets 100-A

No. 14-B—Welding—Extra Heavy Welding Neck Flanges for Standard Pipe.

No. 48-P—Oil Burning—Supplement to Oil Fuel Specifications.

Engineers' Specification Index, Page 162.
Advertisers' Index, 170.

VOL. 26 **NO. 9**

The Gas Convention

BEFORE another issue of HEATING AND VENTILATING is off the press, plans will have been completed for the forthcoming annual convention of the American Gas Association in Atlantic City, October 14-18. By far the largest exhibit of gas heating equipment ever assembled will be on display, during the convention, in Atlantic City's new Municipal Auditorium.

Make your plans now to attend the convention. Not only will you receive a liberal education in the progress that is being made in the application of gas for heating buildings, but you will see there many old-line heating men who have caught the significance of gas as one of the standard fuels.

A. S. Armagnac

HEATING AND VENTILATING, formerly The Heating and Ventilating Magazine, is published monthly by National Building Publications, Division of National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y., publishers of The Architectural Forum, Building Age, Good Furniture and Decoration, and Home Builders' Catalog.

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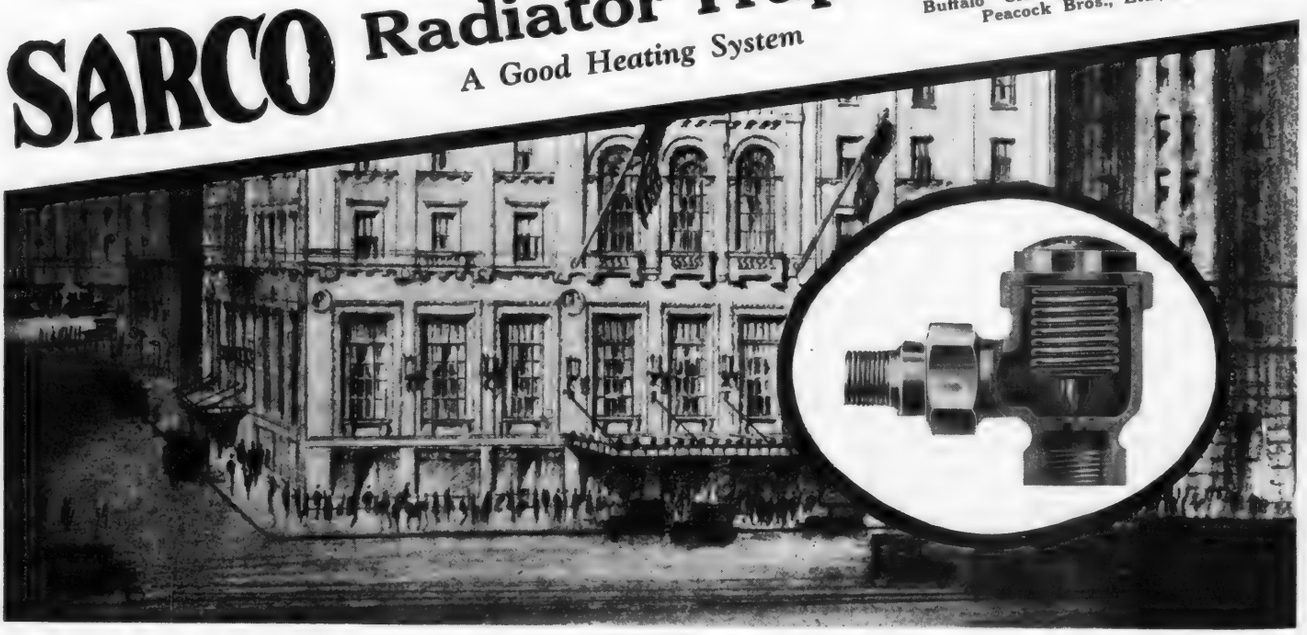


HEATING AND VENTILATING

Editorial

AFTER more than one false start King Coal at last has entered the lists in the Battle of the Fuels in a way that promises a real "hoss race." During the early ascendancy of gas and oil the coal interests spent their major effort in a campaign of detraction, broadcasting, for instance, the occasional fires and explosions traceable to oil-burning appliances, and the alleged excessive cost both of oil and gas. Not only in their official publications but in local newspapers throughout the country the character of the articles and other publicity matter left no doubt that the word had gone forth to "knock" oil and gas at every opportunity. Weird and wonderful were the deductions drawn from data often unrelated and, at best, applying only to the particular cases under discussion. Yet the moral was driven home with relentless force, not that coal was the best fuel, but that oil and gas were dangerous, as well as costly.

The effect was startling, but it was not what the coal people anticipated. Many of the news items quoted in the propaganda, when run down to their source, were found to be garbled, to put it mildly, while the data, to a large extent, were susceptible of different interpretations, depending upon who did the interpreting. At the time HEATING AND VENTILATING editorialized on the futility of the negative campaign adopted by the coal interests and urged the inauguration of one based on the acknowledged merits of coal. Our readers will recall the editorial discussion conducted in these columns on "How Much Oil Equals a Ton of Coal?" in which the point was made that it was unfair to draw such a comparison without taking into account the items of convenience and comfort.

Meanwhile, oil and gas continued to grow in popular favor. The climax was reached when the smarter coal dealers, some of whom had been most vehement in their denunciation of oil, came out with announcements that they were prepared to supply oil fuel on demand.

FROM that point the situation has developed rapidly. During the last three years various groups representing the anthracite coal interests have joined forces with groups interested in the production and sale of anthracite-burning equipment, the whole forming a combination that is proceeding along the right lines to restore coal to its place "in the sun." Through the Anthracite Operators' Conference a subsidiary body was formed, under the name of Anthracite Coal Service, with the object of aiding dealers, training dealers' salesmen and distributing helpful information to the consumer through the dealer. A supplementary organization, known as the Anthracite Bureau of Information, devotes its activities to collecting and disseminating statistical information.

At the beginning of this year a conference of operators and engineers, all experts in their lines, led to the formation of a program of research as an additional activity of the Anthracite Operators' Conference. This work promises to play a vital part in the campaign by making available to the public reliable information in the way of operating data on coal-burning appliances, based upon its own findings. Already nearly a dozen automatic stokers and controls are under test in the Frost Research Laboratory, in Norristown, Pa., where the bureau's experimental work is being conducted.

Finally, the Anthracite Equipment Corporation has been formed by the same interests to use the information and data obtained from the laboratory to finance and develop merchandising outlets for stoker and other coal-burning appliances. Only such appliances as have been tested and approved by the research laboratory of the Anthracite Operators' Conference will receive the support of the Anthracite Equipment Corporation at present.

IT is evident that, with its new set-up, the Anthracite Operators' Conference is prepared to do an effective job for anthracite coal which should go far towards restoring it to public favor. Thanks to recent developments in the field of domestic stokers, the coal industry now is nearer than it has ever been to the achievement of Automatic Heat, and it is safe to say that the industry will use this trump card for all it is worth.

Heating and Ventilatin

Passengers in the Boeing Tri-Motored Transports Are Kept Comfortable by Adequate Heating and Ventilating Systems

One of the Twelve Boeing System 18-Passenger Air Transports for Transcontinental Service

(Right) Heat Is Supplied to the Cabins from the Exhaust Pipe Shown Below the Center Motor

Large Air Transport

by **FRANK CANNEY**
Engineer, Boeing Airplane Company

Startled by Lindbergh's 3600 mile flight across the Atlantic, the nation gave aviation the attention and favor it needed for more rapid development.

The amazing 420-hour sustained flight of the St. Louis aviators proved the endurance of the modern motor and plane.

A recent development, the new aero-Diesel engine, makes possible greatly increased reliability together with revolutionary reductions in fire hazard and fuel costs.

And now the heating and ventilating industry contributes to the next requirement of modern aerial transportation—Comfort.

GREAT sky liners winging their way over the extensive network of air lines that cover the country are a common sight; great quantities of air mail are moved by plane between distant cities, and the drone of an airplane motor is commonplace. The business and traveling public has definitely accepted air travel as an essential component of the national system of transportation and communication, and the airplane is an established agency of travel. Its great efficiency, founded on its speed and mobility, insured for the airplane a position achieved by an unprecedented rapidity of development. Safety, speed and regularity are characteristics of air travel. Today patrons of air transport services are asking and receiving comfort comparable with that of the Broadway Limited.

During the twenty-five years which have elapsed since man's conquest of the air, great progress has been recorded in the development of aircraft. The primitive, open airplane of the Wright Brothers has steadily been improved. From Europe come reports of an aircraft designed to carry more than one hundred persons. American aircraft manufacturers constantly are increasing the size of their products.

A fleet of twelve eighteen-passenger transports for service on the trans-continental route of the Boeing System is nearing completion at one of the largest airplane factories in the United States, that of the Boeing Airplane Company of Seattle, Wash. This company recently built a twelve-passenger plane which is now serving on the western division of the 1943-mile Boeing route between San Francisco and Chicago, but a ship with greater carrying capacity was necessary to accommodate the increasingly large volume of passenger traffic. The cabins of the new eighteen-passenger multi-motored ships are approximately 19 ft. long and 63 in. wide. In the front of the plane is the compartment for the two pilots.

One of the big problems in the construction of the new transport was the development of a satisfactory heating and ventilating system for the cabin. The importance of this could not be minimized, for comfort is an essential feature of air travel, and correct heating and ventilation of the cabin is a requisite for comfortable traveling. Since the planes usually fly as high as 12,000 or 13,000 ft. in crossing the mountain ranges, extreme conditions are encountered on the transcontinental route of Boeing Air Transport, and the temperature often varies from 35° below zero to 135° above.

When the twelve-passenger transports were placed in operation, the

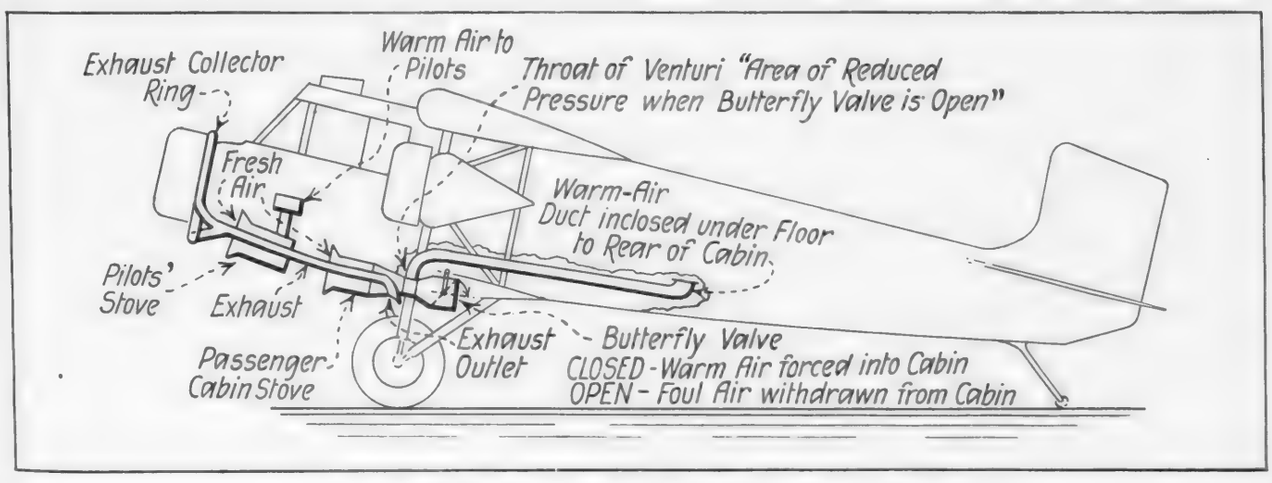

Exhaust Collector Ring
Warm Air to Pilots
Throat of Venturi "Area of Reduced Pressure when Butterfly Valve is Open"
Fresh Air
Warm-Air Duct inclosed under Floor to Rear of Cabin
Pilots' Stove
Exhaust
Exhaust Outlet
Butterfly Valve
CLOSED - Warm Air forced into Cabin
OPEN - Foul Air withdrawn from Cabin
Passenger Cabin Stove

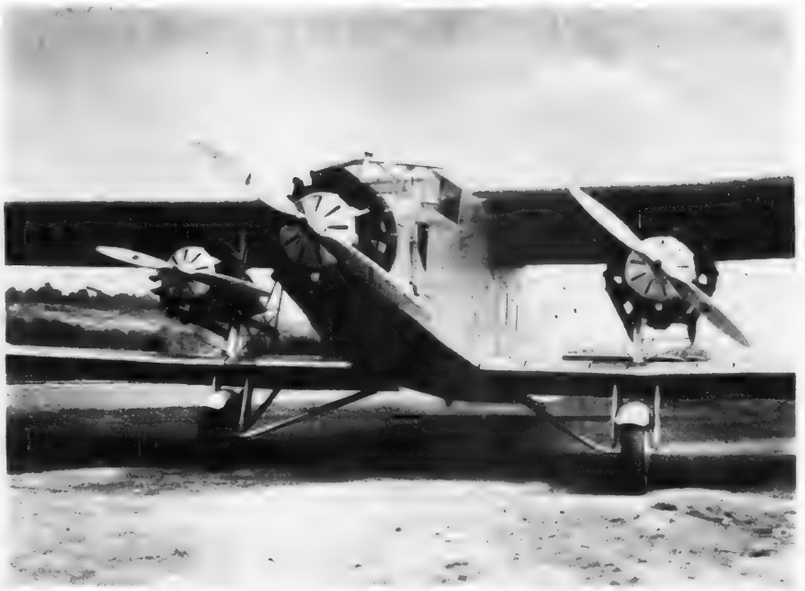
Diagram of the Heating System in the New Boeing Planes

Boeing engineering personnel was able to study its performance and develop a satisfactory heating and ventilating system for the eighteen-passenger ship. It was learned that open windows could not be depended upon as a ventilation system. The blast of air is too strong for comfort, and the uneven distribution is unsatisfactory due to drafts. The ventilating problem, then, is the provision of fresh, cool air for the cabin to keep the air clean, and to keep the temperature of the cabin at a comfortable degree, even though the outside temperature is 100° F. or more.

It has been determined that the flow of air in the cabin of an airplane in flight is from rear to front. It is necessary, therefore, that the inlet for the ventilating system be placed at the rear of the cabin. However, the Boeing engineering personnel realized that individual preferences in the matter of heating and ventilation differ appreciably, so a system of individual ventilation to supplement the main system was evolved. Individual air intakes, Aero Vents, were placed at each window of the cabin. At each window an apparatus is installed, controllable by the passenger. By a simple operation, a sort of scoop is thrust out into the air stream, which directs a stream of fresh air into the cabin through a small decorative 1½-in. grille. The volume of the flow of air may be controlled by the passenger. Thus each passenger may adjust the ventilating system to suit his own needs.

At the top rear of the cabin, on each side, is a larger fresh air intake, through which fresh air enters and moves to the front of the cabin. The volume of the air stream through these apertures also may be controlled to suit the needs of the passengers and to accord with the type of weather conditions during the flight. With such a double system of ventilation, the problem of fresh air was solved.

Heating requirements for the airplane include an available supply of fresh, warm air to maintain a temperature of comfortable warmth, even though the outside temperature be well below zero. The warm air must be free from engine and exhaust odors, for such air is hardly conducive to pleasant traveling. Hot water heating systems are unsatisfactory because of their required weight. The most satisfactory system of cabin heating at present is one utilizing the exhaust heat, and the system for the pew planes is of this type. With the exhaust heat method it is difficult to keep the air free from traces of gas or other exhaust odors.



The Exhaust Collector Ring Leads to the Main Exhaust Pipe which Supplies Heat to the Cabins

The Boeing transport is trimotored, one motor being secured to the nose of the fuselage. The tail stack, or exhaust pipe, is extended down from the base of the radial motor underneath the floor of the fuselage to a point just to the rear of the front of the passenger cabin. This stack is made of chrome-molybdenum steel, and is 5¾ in. in diameter. The stoves, or heating cylinders, are made of duralumin, a light, strong aluminum alloy, and are 7¼ in. in diameter. There are two stoves—one, 2 ft. in length, for the pilots' compartment, and another, 4½ ft. in length, for the passenger cabin. They are placed around the exhaust stack directly underneath the respective compartments.

The stoves are belled out at the front end, so that an adequate amount of fresh air may be received. The air enters the stove and passes along next to the hot exhaust stack, which finally turns down and terminates a few inches in front of the end of the stove. The stove itself terminates in a Venturi, at the end of which is a butterfly adjustable valve. The intake for the passenger cabin is at the throat of the Venturi.

With the valve closed, the flow of warm air is naturally directed up into the intake, which leads to a conduit in the interior of the cabin. This conduit, which is made of dural and is 6 in. in height and 1½ in. in width at the bottom, is carried along the floor at either side of the cabin. The conduits terminate at the rear of the cabin, and the warm air is released through small gates at the ends of the conduits.

Warm-air flow may be cut off by opening the valve at the throat of the Venturi. When the valve is opened, the heating unit will act as an aid to the ventilating system, for the suction created in the throat of the Venturi by the escaping warm air will serve to draw air through the heating conduit from the cabin to the Venturi.

The stove for the pilots' compartment is placed directly in front of the cabin stove, and the intake leads from the end of the smaller stove into the pilots' cabin. This stove, however, does not terminate in a Venturi.

These systems of ventilation and heating are not seasonal, but can be put into operation at any time. Thus, in flying the western division of the transcontinental air-mail, passenger and express route of Boeing Air Transport, where the flying altitude ranges from sea level to 12,000 feet, with consequent extremes of temperature, cool air can be supplied at the start of the flight; later when it is desired, a flow of warm air is introduced.

Elementary Fan Engineering

by **CHARLES A. CARPENTER**

Carpenter & Byrne, Pittsburgh, Pa.

A CENTRIFUGAL fan is a wheel containing several blades operating in a suitable casing and rotated by power applied to the shaft upon which the wheel is mounted. Air enters through circular openings in the casing concentric with the shaft. Similar openings in the wheel permit the incoming air to be influenced by the wheel blades so that the air is expelled into the surrounding casing and thence to the desired ducts, stokers, exhaust flues, etc.

The centrifugal action of the rotating wheel blades sets up differential pressures so that air readily is drawn into the casing inlets and forced through the casing and connected ducts.

Fans designed many years ago generally were driven at some speed selected by the fan builder and certain more or less crude engineering constants were used. It was assumed that a definite relation existed between peripheral velocity of the wheel and the pressure produced. It also was roughly determined that a given design would produce a volume equivalent to the cubical contents of the wheel times the R.P.M. times a constant. This constant is styled volumetric efficiency. Experience soon showed that relative inlet velocities and relative wheel proportions, that is, the ratio of wheel width to wheel diameter, influenced performance.

Since that time it has generally been accepted by fan manufacturers that more carefully-obtained engineering data are necessary to build equipment that will perform as claimed. Centrifugal machinery is better understood, and more accurate designing factors are available. These factors largely are determined experimentally and are used in connection with certain generally-accepted laws applying to centrifugal machines of exactly similar design but of various sizes.

The fundamental laws of centrifugal fans are as follows:—

With the same fan operating in connection with an unchanging airway,

(1) The volume varies directly as the R.P.M.
(2) The pressure varies as the square of the R.P.M.
(3) The horsepower varies as the cube of the R.P.M.
(4) The speed is proportional to the square root of the head.
(5) The power is proportional to the 3/2 power of the head.
(6) The power varies as the square of the diameter of the impeller.
(7) The speed is inversely proportional to the diameter.

Within the usual working range of performance, the fan efficiency is assumed to be constant for these laws.

Current practice in fan engineering starts with a definite test of some desired design. The test is made to determine the relation between volume delivered in cubic feet per minute (C.F.M.) and pressure produced in inches of water (w.g.), the brake horsepower consumed and the mechanical efficiency of the fan. Sufficient tests are made to determine these relations for the entire possible range of operation of the fan at some fixed speed from complete shut-off or no delivery to wide open or free air delivery.

The test data with suitable corrections to bring all results to some standard conditions, such as dry air at 70° F. and 29.92 in. mercury barometer, are then charted with C.F.M. delivered, plotted against water gauge, efficiency and brake horsepower as ordinates. The water-gauge readings may show static or total pressure, according to the method of making the test.

If the test curves indicate a commercially-acceptable result, the tested fan may become a new standard to be built in several sizes, all similar to the experimental fan. A table of performance can then be constructed, generally showing certain definite static or total pressures, definite average velocities through the fan discharge outlet and the corresponding C.F.M. delivered, R.P.M., and brake horsepower.

An inspection of most fan catalogs will reveal that performance tables are so constructed. By inspection of such tables, taking one of the fixed pressures such as 1 in. or 1¾ in. it will be found that doubling the diameter of the wheel cuts the R.P.M. in half, quadruples the volume and quadruples the horsepower; also doubling the R.P.M. of any one of the standard fans doubles the volume, doubles the outlet velocity, quadruples the pressure and multiplies the horsepower by 8.

It is apparent that the older methods of fan design and the present methods are really not so far apart. For any relative point of fan operation, such as complete shut-off, 25% of wide open, free air delivery, etc., standardized fan tables are based on the assumption that all fans of the same design will have the same volumetric efficiencies and will produce pressures in fixed relations to peripheral velocity or tip speed.

With the development of accurate testing it became evident that certain fan relations can be formulated so as to simplify calculations. It has also been demonstrated that the pressure produced by a fan operating at fixed volume and fixed speed varies directly as the density of the gas handled.

The most frequently-needed rules and formulae are given below based on the following nomenclature:—

C = capacity in cu. ft. per min.
P_t = Total pressure in inches of water.
P_s = Static pressure in inches of water.
N = R.P.M.
E_m = Mechanical efficiency.
E_s = Static efficiency.
AHP = Horsepower transmitted to the air based on total pressure.
$(AHP)_s$ = Horsepower transmitted to the air based on static pressure.

BHP = Brake horsepower required to drive fan.

P_v = Velocity pressure ($P_t - P_s$).

V = Velocity in feet per minute.

Static pressure is that exerted by the air independent of its motion. The steam gauge on a boiler indicates the static pressure of the steam. A fluid in motion also exerts a pressure due to its velocity, and this is known as velocity pressure. Total pressure is the sum of the velocity and static pressures.

With a water temperature of 70° F.,

$$AHP = \frac{CP_t}{6356}$$

That is, horsepower transmitted to the air equals the product of C.F.M. by total pressure, divided by 6356. Likewise

$$(AHP)_s = \frac{CP_s}{6356}$$

$$BHP = \frac{AHP}{E_m} = \frac{(AHP)_s}{E_s}$$

The constant, 6356, is derived from the horsepower factor of 33,000 ft. lbs. per min. and the relation between inches of water gauge at 70° and pounds per square foot. One cubic foot of water gauge at 70° weighs 62.31 lbs. One inch of water gauge, therefore, represents 5.19 + lbs. per square foot.

$$\frac{33000}{5.19} = 6356$$

It is important to note that AHP is independent of air or gas temperature, barometer, or density, provided the actual C.F.M. and water gauge are used as measured. In fact, the identical formula may be used for calculating horsepower transmitted to water by a pump, although it is customary to use different units of measure for this service.

The pressure produced by a fan is dependent upon velocity and gas or air density. At constant speed and constant volume, with practically constant efficiency, the pressure produced will vary directly as the density and the horsepower will vary similarly.

Considering air, the density varies directly as the barometer, inversely as the absolute temperature (460° + thermometer temperature) and, according to a more complicated relation, with relative humidity. Therefore, it is highly desirable to recognize some standard as the basis for rating fans, such as dry air at 70° F. and 29.92 in. mercury barometer.

With a barometer of 27 in. air weighs 9/10 of the weight at 30 in.

At 600° F., or 1060° abs., air weighs ½ as much as it does at 70° (530° abs.)

Therefore, a fan rated at 29.92 in. Hg. will produce less pressure at lower barometers or higher altitudes, and, if a fan can produce 2 in. w.g. at 600°, it will produce 4 in. w.g. at 70°, consuming twice the power. Fans designed for hot gases should not be run handling cold air unless ample driving power is available.

In order to make a proper fan selection for handling gases other than air, corrections must be made for the difference in density.

(*To be continued*)

New York Commission on Ventilation May Suspend Activities

ALTHOUGH no official announcement has been made, indications at the present time are that the New York Commission on Ventilation will discontinue activities on or about September 30.

The New York Commission on Ventilation is a direct descendant of the New York State Commission on Ventilation, which was organized in 1913. In that year, the Governor of New York appointed six commissioners to investigate ventilation systems and examine the existing data on the subject. Charles E.-A. Winslow, Edward Lee Thorndike, James Alexander Miller, M.D., Frederic S. Lee, Earle B. Phelps and Dwight D. Kimball were the six members of the commission. The work of the commission was concluded in 1917, and a complete report of the commission's work was published in 1923.

Some of the members of the New York State Commission decided, in 1926, to continue their work in this field and organized the New York Commission on Ventilation. In this organization were included the members of the old commission with the exception of Dr. James Alexander Miller. His place was taken by Dr. Rufus Cole. George T. Palmer, chief of the investigating staff of the New York State Commission, was made a member of the new, unofficial commission, and Thomas J. Duffield was appointed executive secretary.

In view of the radical conclusions contained in the early report of the commission, it is significant to note that in the recent "Report on Schoolroom Ventilation Study, Syracuse, N. Y.," by Thomas J. Duffield, which appeared in the "American Journal of Public Health," the findings are more conservatively stated. In this report it was stated that "in contrast to the apparently clear-cut superiority of the furnace-gravity schools during the first year's study, the findings of the second year are contradictory and confused. This would seem to indicate that in so far as the incidence of respiratory illness is concerned, more evidence is necessary before it is possible to say that one of the types of ventilation under investigation is superior to another." It also was stated that "it would be manifestly unfair to condemn mechanical ventilation simply because the school with that type of ventilation showed higher rates of absenteeism due to respiratory illness. The data must be examined with reference to both the race stock of the pupils and the type of ventilation."

It is to be regretted that neither the New York State Commission on Ventilation nor the New York Commission on Ventilation to date has ever submitted data which could be accepted without controversy by engineers and physicians alike, as a guide to improvement in school ventilation systems.

"River Coal" Popular in Pennsylvania

In a report recently issued by the United States Bureau of Mines, it is stated that the three rivers draining the Pennsylvania anthracite fields—the Susquehanna, Schuylkill, and Lehigh—have been carrying away thousands of tons of combustible material annually for almost a century. The resulting deposits of coal in these streams have been a fruitful source for coal-dredging operations. Most of the dredge coal is recovered from the Susquehanna and its tributaries — Wiconisco, Mahony, Shamokin, and Swatara Creeks. The Schuylkill River is second in importance, and a small amount is also taken from the Lehigh River.

The "river coal" consists chiefly of sizes equivalent to buckwheat No. 3 and boiler. Much of the dredge coal is sold for steam raising at nearby points, and in recent years it has been quite popular as a domestic fuel in Harrisburg, York, Sunbury, and other cities, for which purpose it is burned under forced draft in heating boilers. Prices obtained for dredge coal have declined since 1920, and have averaged slightly less than $1 per gross ton in the last five years.

Tulsa Coliseum, Tulsa, Oklahoma

Coliseum Heating and Cooling Equipment

by **R. F. TAYLOR**
Mechanical Engineer

A FORCED warm-air system, a vacuum steam heating system, and a refrigerating system for freezing ice in a skating rink, are embodied in the Tulsa, Okla., Coliseum, which was opened the first of January. The mechanical equipment, on which the success of the enterprise was dependent, met every expectation.

The main feature of the building is the ice skating rink, the ice sheet being 90 ft. wide and 215 ft. long. Since the hall is 360 ft. long, 180 ft. wide, and 30 ft. high, with a capacity of 10,000 spectators, the design of the heating and ventilating systems presented an interesting problem. Quick and even heating at moderate cost was desirable, and it was finally decided to install a fan furnace system for the main hall. For the warming rooms, corridors and other public room spaces, a direct steam heating system was provided.

Of heavy cast-iron construction, the four No. 108 Solar furnaces are so designed that expansion and construction are provided for. The products of combustion are required to travel the length of the heaters three times before reaching the smoke pipe and thence the stack. This, coupled with the direct transmission of heat from the interior of the furnace through the heater surface to the air, results in the proper utilization of the fuel.

An insulated steel casing surrounds all four heaters in such a manner as to provide a space under the heaters to receive the air from the fan and a space over the heaters to form a warm-air plenum.

Warm air, either recirculated or fresh, is forced over the furnaces by a No. 11 double-inlet double-width Sturtevant Multivane fan, having a capacity of 60,000 cu. ft. of air per min. The air is then conducted through galvanized iron ducts to outlet grilles in the side wall and ceiling of the arena. The air is removed from the arena through vent and return air grilles along the entry stair halls adjoining the main arena floor. The system was installed by the John H. Kitchen Co., Kansas City, Mo.

Automatic system of temperature regulation is a part of the forced warm-air system. The conventional pneumatically-controlled double-leaf mixing dampers are placed at the junction of warm-air pipes from the warm-air plenum and tempered air ducts from the space under the heaters. The location of the mixing dampers is at the sides of the heaters.

Water pans installed in the warm-air plenum space are piped in series with an automatic filling tank and a coil in the combustion space of one of the heaters to furnish the necessary moisture.

A high temperature thermometer, the thermal element of which projects into the warm-air plenum space, is provided as an aid to the operator in the regulation of his fires.

Natural gas is burned in the heaters, Mettler burners being used. The safety controls used in connection

Brine Coils in Arena Floor Before Covering

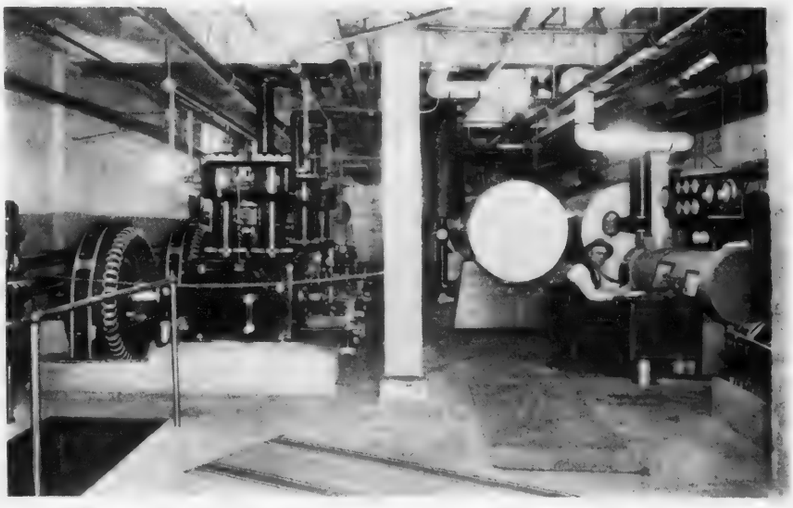
with the burners comprise (1) electrically-operated snap valves in the gas supply branch to each heater; (2) safety pilots which will shut off the burner gas supply and also the pilot gas supply through control of the snap valves, in event the pilot flame becomes extinguished, and, (3) a temperature limit control for the warm-air plenum, which will cause the snap valves to shut off the burner gas supply whenever the temperature in the plenum exceeds that for which the device is set.

Between the fan used in connection with the forced warm-air system and the 20 H.P., three-phase, 220-volt motor is a Texrope drive.

In the offices, dressing rooms, toilets, skate rooms, check rooms, and warming rooms, a downfeed vacuum heating system was installed by the Watt Plumbing and Heating Company, of Tulsa.

Steam is generated in a Kewanee portable steel boiler. It is equipped to burn gas, a Schwan gas burner being provided. This boiler also provides steam for heating the water for the shower rooms and for heat-

View of Arena Showing Ceiling Grilles and Ice-Covered Floor

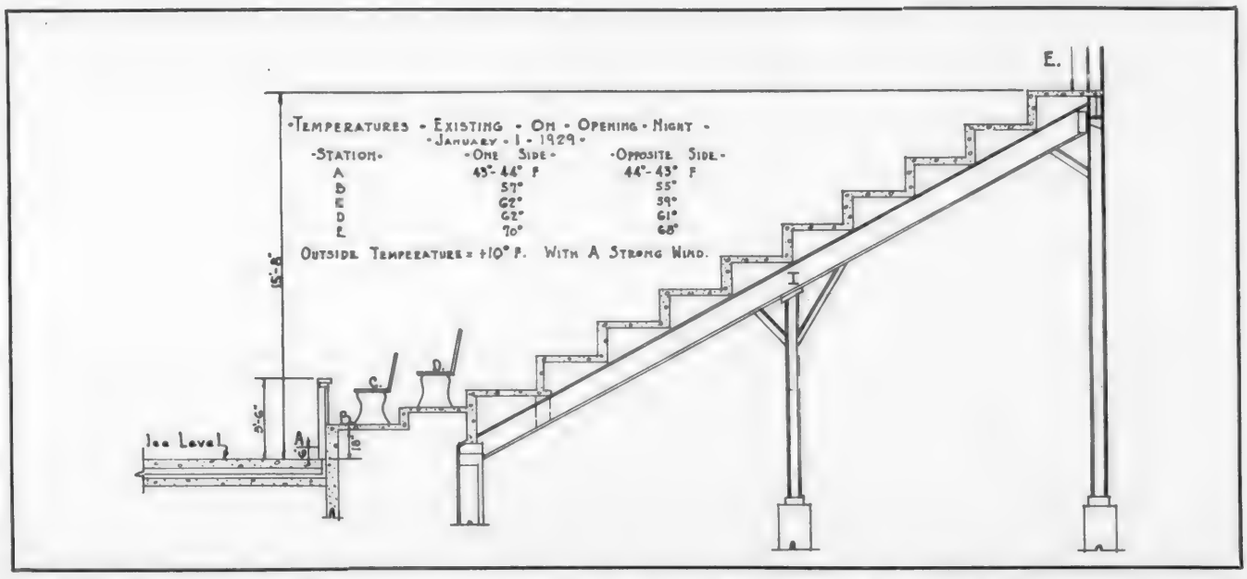


Three 40-Ton Compressors and Brine Coolers in the Tulsa Coliseum

were then laid, on which were placed 60,000 ft. of 1¼-in. brine circulating piping spaced on 4-in. centers running across the rink. Each coil is approximately 184 ft. long and is served from the supply and return headers running in the tunnel at the side of the rink. Each coil is continuous welded, there being no joints beneath the skating surfaces. Clean, dry sand was then placed over the rink and finished off flush with the top of the pipes. Over this was placed a 3-in. bed of patent non-cracking concrete (utilizing steel shavings) and finished off with a Terazzo topping.

A purge header runs parallel to and is of the same length as the

(Continued on Page 70)

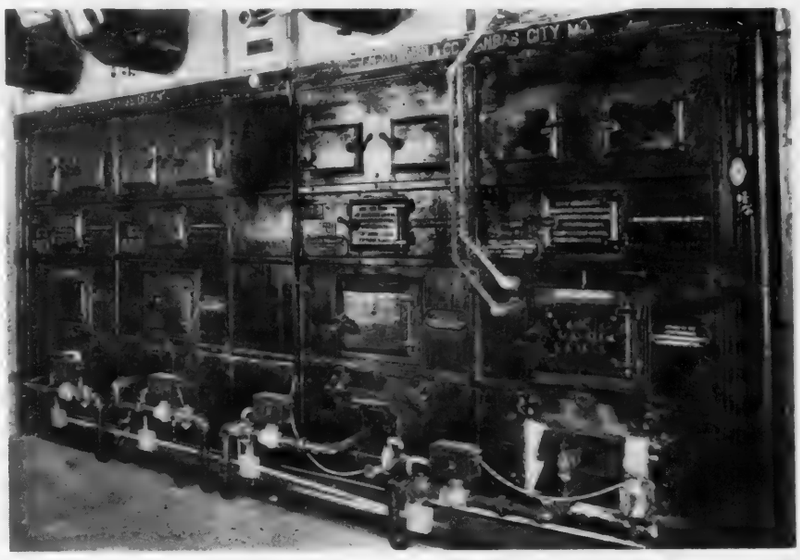


Record of Inside Temperatures in the Coliseum on the Opening Night When the Floor Was Covered with Ice

ing the brine used to melt the ice on the rink. After being partially melted, the ice is scraped up and shoveled into an ice bin where it is completely melted by a steam coil. An electric-driven vacuum pump is provided for returning the condensation to the boiler.

Refrigeration equipment consists of three 9-in. x 9-in. enclosed-type single-acting, vertical, double cylinder ammonia compressors, direct connected to 75 H.P. Westinghouse synchronous motors operating at 225 R.P.M.

The arena ice rink floor was constructed as follows: a 6-in. concrete base was overlaid with a 2-in. corkboard insulation laid in asphalt with overlapping joints and coated with waterproofing. Angle iron sleepers



Front of Gas-Fired Furnace for Heating Main Hall

Interior of John Van Range Company Plant, Cincinnati

Space Heating With Gas

by **A. A. BLOMFELDT**

WHILE neary 100,000 central gas house-heating plants have been installed in homes in this country, the heating of large spaces, such as industrial buildings, by gas-fired appliances has not been attempted on a large scale until recently. The reason has been that even with the special rates available to industrial plants for both heating and process work, the cost, in comparison with that of other fuels, has been far too high for use in space heating.

In spite of the high cost, gas has been pushing steadily to the front as an industrial fuel for heat treating, baking, melting and other numerous uses, largely because of the automatic control possible with gas. A recent development, the gas-fired unit heater, places gas in a position to compete with other fuels for industrial space heating loads.

One of the largest gas-heating installations in the world is that in the John Van Range Company plant in Cincinnati, O. The building, 440 ft. long, 440 ft. wide and 26 ft. high, is constructed of brick side walls with a monitor type roof covered with composition. The building contains 60,000 sq. ft. of exposed glass surface with a heat loss at design temperatures of 15,000 B.T.U. per hr.

In the factory building 26 No. 8 Sterling gas-fired unit heaters are suspended from roof trusses and controlled in groups of four and five from one thermostatic control panel. In the office section of the building, a four-story structure, the same type unit heaters with slow speed fans are installed. These are equipped with sheet metal ducts to distribute the heat in specific desired locations.

The unit heaters are constructed of cast-iron combustion chamber plates and heavy-gauge steel tubing. The burners are entirely enclosed. The fan forces the cold air between and around a series of staggered steel tubing through which the products of combustion pass direct from the burners. Cold air is forced through an economizer for preheating, after which the air passes around the staggered tubes through which the products of combustion are passing direct from the burners. The air is deflected downward by an adjustable hood and spread over the floor space. The heater can be mounted either on wall brackets or suspended from trusses. The three gas burners in each unit heater are of the atmospheric type with a multiple orifice auxiliary needle valve used in the mixers. Each heater has a capacity of 363,000 B.T.U. per hr., when burning 900 B.T.U. natural gas.

In addition to the thermostatic control, each bank of heaters is electrically started and stopped at different predetermined hours by means of electrical controls connected in series with an electric thermostat. Special electric relay switches are connected with time element relay coils that automatically carry any overload in starting, thus protecting the thermostat, clock and other controls.

The amount of gas supplied in each heater is regulated by means of a motor-operated gas valve connected in parallel with the fan motor. Each unit can be controlled individually by moving the electric switch control into the on or off position.

In order to maintain constant temperatures during cold weather in isolated offices, toilet rooms and stairwells, specially designed small-size Sunnyaire gas-fired heat cabinets were installed, with automatic diaphragm control on each cabinet. In some cases the cabinets are furnished with cold air recirculating fans. The heating element of these units are of cast iron and the cabinet is finished in sage green with ornamental outlet grilles.

Natural gas rates in Cincinnati for large industrial users are as follows:

$0.75 per 1000 cu. ft. for first 5000 cu. ft.

$0.70 per 1000 cu. ft. for next 5000 cu. ft.

Rear and Side View of Gas-Fired Unit

$0.65 per 1000 cu. ft. for next 5000 cu. ft.

$0.60 per 1000 cu. ft. for next 5000 cu. ft.

$0.55 per 1000 cu. ft. for next 5000 cu. ft.

$0.50 per 1000 cu. ft. for next 5000 cu. ft. (All consumption above 25,000 cu. ft.).

These are based on a monthly rating. The gas has an average heating value of 850 B.T.U., net, and is a mixture of artificial and natural gas.

The plant uses a considerable amount of gas for industrial purposes, and the total gas supply is measured by the same meter. The total cost of gas used for the season 1927-28, was $12,774.80. After deducting the cost of the gas used for industrial processes, amounting to $2,142.00 the net cost of heating the building for the season was $10,632.80. In 1928-29, the cost was $10,272.50, making the average for the two years $10,452.65.

To this must be added the cost of the electrical input supplied to the fan motors and electrical controls. This averaged $417.28 for the two seasons, so that the average total operating costs were $10,869.93.

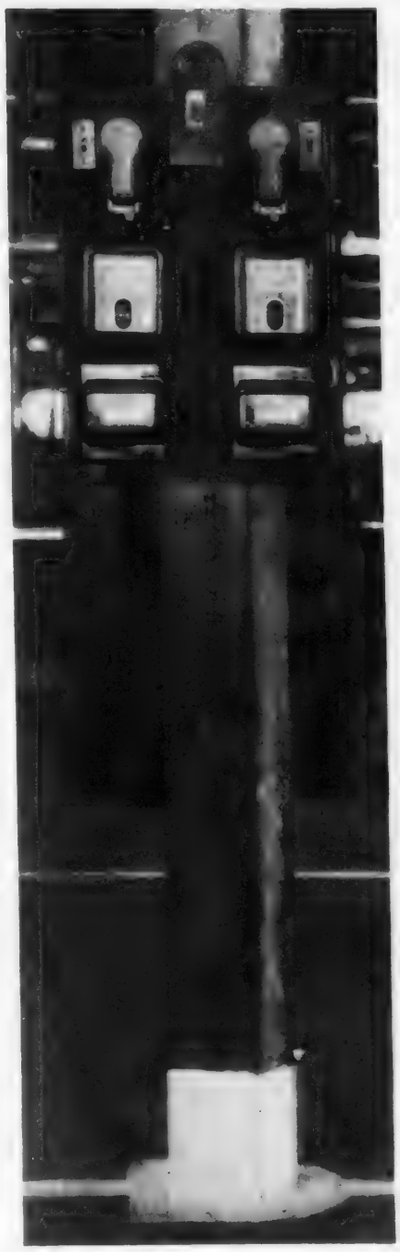
The design temperatures for the system were 0°-70° for both the shop, and the office, giving a maximum heating requirement per hour of 15,000,000 B.T.U. The unit cost of coal was estimated at $3.25 per ton, delivered, with a value of 13,500 B.T.U. per lb.

In Cincinnati there are an average of 200 days per year when heat is required and the average over the heating season is approximately 33% of the maximum proposed. For night and week-end service, 50% of the working hour requirement was used in the estimate:

165 working days × 9 hrs. × 33% × 15,000,000 B.T.U. = 7,350,750,000 B.T.U.

165 nights × 15 hrs. × 33% × 15,000,000 B.T.U. × 50% = 6,125,625,000 B.T.U.

35 week-end days × 24 hrs. × 33% × 15,000,000 B.T.U. × 50% = 2,079,000,000 B.T.U.



Control Panel for Gas-Fired Unit Heater System

Rear View of Cabinet Heater Installed in Isolated Rooms

Total heating requirement per year = 15,555,375,000 B.T.U.

Fuel Cost with Gas-Fired Units

Heating with gas-fired unit heaters (estimated):

850 B.T.U. per cu. ft. at 85% eff. = 722.5 B.T.U. delivered.

15,555,375,000 ÷ 722.5 = 21,530,000 cu. ft.

21,530,000 cu. ft. at 50c per thousand = $10,765.00 per year.

Fuel Cost with Coal Boilers

Heating with coal (estimated):

13,500 B.T.U. per lb. at 60% eff. = 8,100 B.T.U. delivered.

15,555,375,000 ÷ 8100 = 1,920,416 lbs. or 960.2 tons of coal per year.

960.2 tons at $3.25 = $3,120.65 per year.

With a coal cost of $3,121, two firemen at $1800 per year each, and a $300 maintenance charge, the operating total for the coal plant would be $7,021. The yearly cost of coal does not include a factor of safety for banking, firing, etc.

The contents of the building, not including the train shed, which was unheated, total 4,133,680 cu. ft. The total operating costs divided by the contents in cu. ft. show a cost of $0.00263 per season per cu. ft. of space heated.

The total number of degree days for Cincinnati for the season 1927-28, was 4909, and in 1928-29, 4713—an average of 4811 degree-days. With an average gas consumption of

21,739,860 cu. ft. of gas per season, the fuel consumption amounted to 1.092 cu. ft. per 1000 cu. ft. of space per degree-day.

Based on the estimated maximum heat loss, or heat loss at design temperatures, amounting to 15,000,000 B.T.U. per hour, the gas consumption was 0.303 cu. ft. per 1000 B.T.U. heat loss per degree-day.

A report, prepared by independent engineers who recommended a coal-fired plant, provided for the following equipment and included the estimated cost:

3 Boilers	$12,000
3 Stokers	5,500
2 Feed pumps	500
1 Feed water heater	500
Piping	1,500
Building	6,000
Total	$26,000

Fixed charges can be estimated as follows: Interest, 6%; depreciation, 5%; insurance, ½% (for coal-burning system) and ¼% (for gas-burning system); taxes, 2%—a total of 13½% for the coal system and 13¼% for the gas system.

The lowest bid submitted for the installation of a coal-fired system, including the cost of material listed above, totaled $90,000. The bid for the gas-fired unit heater system was $60,000. Not only the cost of material but also the labor costs were less with the latter system.

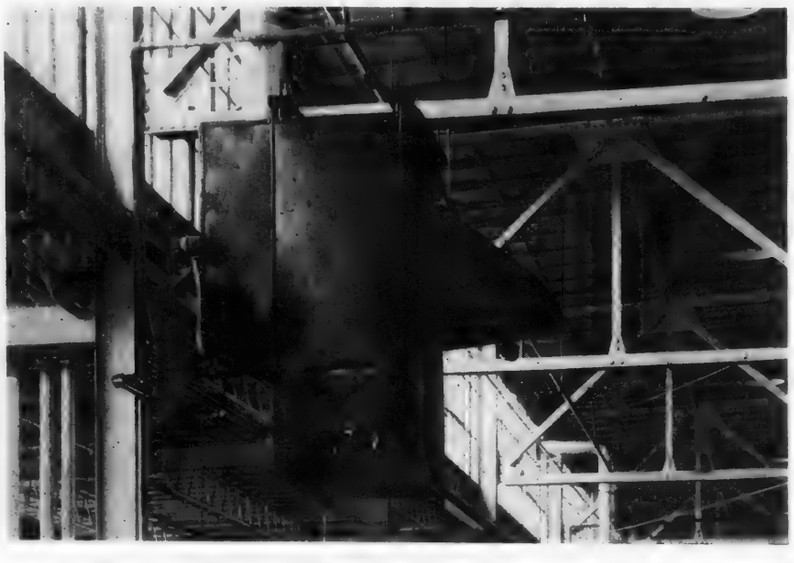
Yearly fixed charges for the coal system, based on the $90,000 bid, would total $12,150, while for the gas system, based on the $60,000 bid, these charges amount to $7950. Added to the operating costs, the total yearly costs of the coal system are $19,171. For the gas system these costs are $18,820, thus showing an annual saving of $351 for the gas system.

There are numerous advantages in a gas-fired unit heater system, as compared with the coal-fired steam system. The supply of fuel is always available, and need not be paid for until after it is used. There is no handling of fuel from the cars to storage and from the storage to the boilers. There is no fluctuation in price, no change in the heat content of the fuel, and no delayed delivery.

By eliminating the boiler plant, the cleaning and firing of boilers is eliminated. There is no dirt or ashes to remove. There is no smoke with its attendant evils, among them being the difficulty with the smoke ordinances.

Another advantage of the gas-fired unit heater system is that in the spring or fall, it is not necessary to start up the steam plant to supply the small amount of heat required for the offices. With the automatic gas-fired unit heaters, however, the office or any other unit can be operated independently, with one or more gas burners in operation as needed.

Thus it can be seen that there are numerous advantages not directly measured in dollars and cents obtained by the use of a gas-fired unit heater system.



Gas Pipes and Electric Wiring Are Only Connections Needed with Gas-Fired Unit Heaters

Coliseum Heating and Cooling Equipment

(Continued from Page 67)

brine header. It is 2 in. in size. Each of the crosswise coils are connected to the purge header and provided with valves. The brine feed header tapers in size from 8 in. to 3½ in. at the opposite end. The brine return header varies in the same manner. These headers are welded and each equipped with 323 1¼ in. outlets on 8-in. centers over its length of approximately 215 ft.

Made of black tank steel, the brine storage tank has a capacity of 900 cu. ft., and is insulated in the usual manner. There are two Allis-Chalmers brine pumps of the centrifugal type, one of 800 G.P.M. capacity and one of 400 G.P.M. capacity. These are direct-connected to 20 and 15 H.P. motors, respectively, operating at 1800 R.P.M. There also are provided two brine coolers of the horizontal shell and tube type containing 1800 sq. ft. effective cooling surface. These are of the multi-pass design.

The brine coolers are covered with 6-in. cork. The brine piping in the tunnel alongside the rink is covered with granulated cork. All of the brine piping outside of the tunnel is covered with standard brine thickness cork.

Enclosed Spray Pond Located on Roof

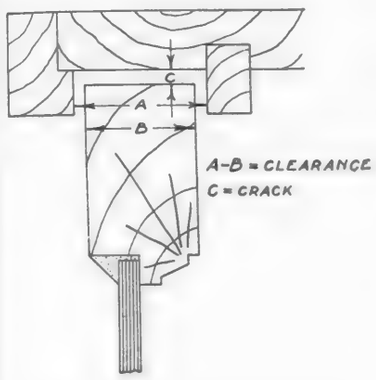
The condensing equipment comprises two horizontal multi-pass shell and tube ammonia condensers, having a total condensing surface of 1800 sq. ft. Connected to these are two 600 G.P.M. condensing water pumps, direct-connected to 15 H.P., 1800 R.P.M. motors. These pumps circulate condensing water to a spray pond located on the roof. The spray pond is 70 ft. x 30 ft. and enclosed by wood louvres built up in 5 ft. sections. The spray nozzles are divided up into four groups, five nozzles in a group, and each nozzle handles 30 G.P.M. at 7-lb. pressure.

Architects for the building were Smith and Senter, of Kansas City and Tulsa. The mechanical equipment was designed by R. F. Taylor, consulting engineer, Dallas, Texas.

A Survey of Window-Frame Construction

by **ALFRED M. LANE**

President, Monarch Metal Weatherstrip Company



Cracks and Clearances

THE two apertures customarily referred to in designating the "Unit Leakage" through non-stripped windows and doors, and which are controllable by weather-strip application, are (1) *crack* and (2) *clearance*. As shown in the diagram above, the *crack* (C) is equal to one-half of the difference between the width of the frame between running stiles and the width of the sash. The *clearance* is designated as (A-B), where A is the width of the runway between the stop and the parting bead, and B is the thickness of the sash.

ONE of the least certain things in heat loss calculations is the allowance to be made for air infiltration around windows. Recent tests, for instance, on solid section steel casement sash with clearances of 1/32 in. show a variation in the air leakage of nearly 400%. It is not at all uncommon to find a 100% difference between two sets of figures for a window of the same crack and clearance. In fact, so uniformly inconsistent are many of the figures obtained that more than one manufacturer of metal weatherstrip has expressed the opinion that conditions in two different tests cannot be duplicated sufficiently to get the same readings.

Some time ago the Monarch Metal Weatherstrip Company volunteered to conduct an investigation to determine the amount of crack and clearance which

TABLE 1—MANUFACTURERS' STANDARD WORKING CLEARANCES

Name and Location of Mill	Width of Sash, In. (A)	Width of Runway, In. (B)	Difference, In. B-A
Hammond Lumber Co., San Francisco, Cal...	1 3/8 1 3/4	1 13/32 1 25/32	1/32 1/32
Hallack-Howard Lumber Co., Denver, Colo...	1 3/8 1 3/4	1 13/32 1 25/32	1/32 1/32
Frank Miller Lumber Co., Bridgeport, Conn...	1 3/8 1 3/4	1 7/16 1 13/16	1/16 1/16
Phoenix Planing Mill, Atlanta, Ga.....	1 11/32 1 23/32	1 13/32 1 25/32	1/16 1/16
Indiana Lumber and Mfg. Co., South Bend, Ind.	1 5/16 1 11/16	1 3/8 1 3/4	1/16 1/16
Curtis Companies, Inc., Clinton, Ia.....	1 3/8 1 3/4	1 13/32 1 25/32	1/32 1/32
United Sash and Door Co., Sioux City, Ia....	1 3/8 1 3/4	1 7/16 1 7/8	1/16 1/8
Brockway Smith Corp., Boston, Mass.....	1 3/8 1 3/4	1 7/16 1 13/16	1/16 1/16
Bardwell Robinson Lumber Co., Detroit, Mich.	1 11/32 1 23/32	1 3/8 1 3/4	1/32 1/32
Huttig Sash and Door Co., St. Louis, Mo.....	1 11/32 1 23/32	1 13/32 1 25/32	1/16 1/16
Montgomery Bros. and Co., Buffalo, N. Y.....	1 3/8 1 3/4	1 7/16 1 13/16	1/16 1/16
Commercial Sash and Door Co., Zanesville, O.	1 3/8 1 3/4	1 7/16 1 13/16	1/16 1/16
Chattanooga Lumber Co., Chattanooga, Tenn.	1 11/32 1 23/32	1 13/16 1 25/32	1/16 1/16
Houston Co-operative Mfg. Co., Houston, Tex.	1 3/8 1 3/4	1 7/16 1 13/16	1/16 1/16

TABLE 2—VARIATION IN THICKNESS OF STANDARD STOCK WOOD SASH DUE TO MANUFACTURING PROCESSES

Number of Sash Measured.....9
Sash Furnished and Measured by Huttig Sash and Door Co.
Apr. 1, 1924

Sash No.	Top Max., In.	Top Min., In.	Sides Max., In.	Sides Min., In.	Bottom Max., In.	Bottom Min., In.	Differences Top, In.	Differences Side, In.	Differences Bottom, In.
1	1.345	1.300	1.328 1.365	1.300 1.335	1.365	1.345	0.045	0.028 0.030	0.020
2	1.330	1.315	1.345 1.335	1.315 1.315	1.330	1.318	0.015	0.030 0.020	0.012
3	1.332	1.305	1.355 1.346	1.285 1.315	1.328	1.295	0.027	0.070 0.031	0.033
4	1.350	1.295	1.340 1.345	1.315 1.318	1.370	1.330	0.035	0.025 0.027	0.040
5	1.330	1.315	1.335 1.345	1.310 1.322	1.308	1.290	0.015	0.025 0.023	0.018
6	1.330	1.315	1.352 1.350	1.310 1.315	1.335	1.330	0.015	0.042 0.035	0.005
7	1.335	1.325	1.347 1.360	1.310 1.325	1.350	1.333	0.010	0.037 0.035	0.017
8	1.325	1.310	1.350 1.365	1.320 1.330	1.330	1.305	0.015	0.030 0.035	0.030
9	1.355	1.345	1.355 1.350	1.330 1.340	1.316	1.305	0.010	0.025 0.010	0.011
Average							0.021	0.031	0.021

TABLE 3—WINDOW CLEARANCE MEASUREMENTS
Ceramics Building—University of Illinois, Urbana, Ill.

Measurements Made by Prof. A. P. Kratz
Apr. 25, 1924
Age of Building, 7-8 Years

Window No.	Exposure	Width of Sash, In. (A)*	Width of Runway, In. (B)*	Difference, In. B-A*	Total Side Clearance or Crack, In. (C)*	Crack at Meeting Rail	
						Unlocked, In.	Locked, In.
1	North	1.753	1.845	0.092	0.175	0.022	0.014
1	East	1.755	1.837	0.082	0.120	0.023	0.038
2	East	1.757	1.865	0.108	0.115	0.069	0.012
1	South	1.735	1.870	0.135	0.150	0.080	0.025
1	West	1.757	1.850	0.093	0.045	0.045	0.018
Total Average				0.102	0.121	0.0478	0.0214

Height of Sash Overall, 65.0 In. Width, 45.0 In.

Note: Many of the upper and some of the lower sash in this building could not be moved. Such windows are not included.

exists in the average window. The first step in this investigation consisted of sending to nineteen mills in various parts of the country a letter requesting them to designate on the dimension form sheet the manufacturing clearance allowed in double-hung sliding wood windows. A reproduction of these allowances is shown in Table 1.

From this table it will be noted that out of the nineteen mills, only four attempted to work closer than 1/16 in.

In Table 2 are given measurements of nine sashes taken from stock, which show an average difference of 0.0208 in. on the top rail, 0.031 in. on both side rails, and 0.0207 in. on the bottom rail. In short, the total average difference is very nearly 1/32 in. This manufacturing variation, due in all probability to the tools employed in finishing the sash, plus the manufacturing clearance of 1/16 in., gives approximately 3/32 in. clearance before the sash is even shipped from the mill.

Later 934 windows were measured by Monarch representatives in various parts of the country. Sixteen measurements were taken of each window, making a total of 14,944 measurements.

One hundred and seventy-three windows were measured by the engineering departments of ten different universities located in various parts of the country, and five measurements taken of each window, making a total of 865 measurements.

From the above investigations, it was proven that the average crack around the perimeter of the window was practically 3/16 in. and the clearance 3/32 in.

That the above assumption is correct is shown by Tables 3, 4 and 5, giving measurements of windows taken at the University of Illinois and at the University of Nebraska.

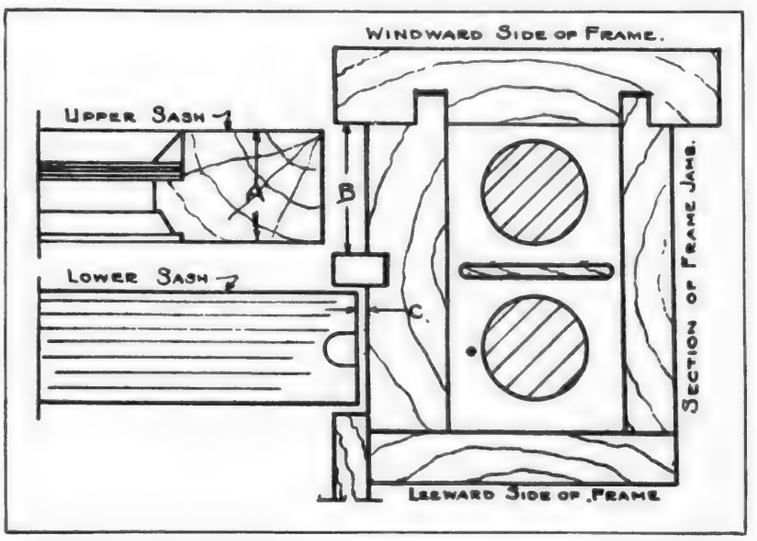
In contrast to the uncertain air infiltration through unstripped windows, both of the double-hung wood type and of the steel casement type, the uniform test results obtained with the same windows properly weatherstripped make it possible for the weatherstrip manufacturers to recommend that all weatherstrip specifications carry some such clause as the following:

"All weatherstrip as specified shall be certified to the respective leakage in cubic feet of air per hour, per foot of crack, per mile of wind velocity." It is further provided that certification shall be made by the manufacturer, giving dates and authorities for factors as certified.

A simple rule offered by the Monarch Metal Weatherstrip Company for figuring the total heat loss per hour due to

TABLE 4—WINDOW CLEARANCE MEASUREMENTS
Mechanical Engineering Building, University or Nebraska, Lincoln, Neb.

Measurements Made by A. A. Luebs
April 11, 1924
Age of Building, 14 Years.



Exposure	Width of Sash, In. (A)*	Width of Runway, In. (B)*	Difference, In. B-A*	Total Side Clearance or Crack, In. (C)*	No. of Window
	1 20/32	1 28/32	8/32	9/32	1
	1 20/32	1 27/32	7/32	6/32	2
North	1 22/32	1 28/32	6/32	6/32	3
	1 21/32	1 28/32	7/32	8/32	4
Average			7/32	29/128	
	1 21/32	1 27/32	6/32	8/32	1
	1 21/32	1 28/32	7/32	8/32	2
East	1 22/32	1 26/32	4/32	9/32	3
	1 22/32	1 27/32	5/32	5/32	4
Average			11/64	15/64	
	1 21/32	1 25/32	4/32	7/32	1
	1 21/32	1 26/32	5/32	8/32	2
South	1 23/32	1 26/32	3/32	8/32	3
	1 22/32	1 25/32	3/32	6/32	4
Average			15/128	29/128	
	1 21/32	1 27/32	6/32	8/32	1
	1 22/32	1 27/32	5/32	5/32	2
West	1 22/32	1 26/32	4/32	8/32	3
	1 22/32	1 25/32	3/32	9/32	4
Average			9/64	15/64	
Total Average			83/512	59/256	

Overall Height of Windows, 85 In. Width, 40 In.

TABLE 5—WINDOW CLEARANCE MEASUREMENTS

Agricultural Engineering Building, University of Nebraska, Lincoln, Neb.

Measurements Made by A. A. Luebs

April 11, 1924

Age of Building, 5 Years.

Exposure	Width of Sash, In. (A)*	Width of Runway, In. (B)*	Difference, In. B-A*	Total Side Clearance or Crack, In. (C)*	No. of Window
	1 24/32	1 31/32	7/32	2/32	1
	1 25/32	1 28/32	3/32	4/32	2
North	1 24/32	1 26/32	2/32	6/32	3
	1 24/32	1 27/32	3/32	6/32	4
Average			7/64	9/64	
	1 25/32	1 30/32	5/32	4/32	1
	1 24/32	1 28/32	4/32	7/32	2
East	1 25/32	1 27/32	2/32	3/32	3
	1 25/32	1 26/32	1/32	2/32	4
Average			6/64	8/64	
	1 24/32	1 27/32	3/32	5/32	1
	1 24/32	1 29/32	5/32	3/32	2
South	1 23/32	1 27/32	4/32	6/32	3
	1 24/32	1 28/32	4/32	7/32	4
Average			8/64	21/128	
	1 24/32	1 30/32	6/32	1/32	1
	1 24/32	1 27/32	3/32	4/32	2
West	1 24/32	1 26/32	2/32	4/32	3
	1 25/32	1 28/32	3/32	4/32	4
Average			7/64	17/128	
Total Average			7/64	9/64	

Overall Dimensions of Windows: Height, 86 In. Width, 42 In.

infiltration is as follows:

A x B x C = H

Where A = infiltration heat loss factors per foot of crack for the type of opening and temperature difference selected.

B = total lineal feet of exposed crack in opening.

C = wind velocity of 15 M.P.H.

H = total heat loss per hour due to infiltration.

If any velocity other than 15 M.P.H. is selected, multiply H by the wind correction factor corresponding to the new wind velocity as given in the accompanying table. This factor is denoted by the letter (K) in the following example:

CONVERSION CONSTANTS FOR VARYING WIND VELOCITIES

(Use for Double-Hung Windows Only)

Miles per Hour	Conversion Constant
10	0.60
15	1.00
20	1.40
30	2.50
40	3.70

Example: Find the total heat loss due to air infiltration occurring through a 3 ft. x 6 ft. double-hung wood window for a temperature difference of 70° F., a wind velocity of 20 M.P.H., a 3/16 in. clearance, and equipped with a two-member interlocking weatherstripped window.

0.89 x 21 x 15 x 1.40 = 392 B.T.U. per hr.

This corresponds with typical figures of 1623 B.T.U. per hr. for a non-stripped window of the same size and clearance, and 1063 B.T.U. per hr. for a rib-stripped window.

All tables copyrighted by Monarch Metal Products Company.

Tests of Various Coals in House-Heating Boilers

The results of 500 tests of various coa's in house-heating boilers are given in Bulletin 276, recently issued by the U. S. Bureau of Mines of the Department of Commerce. The tests were made to obtain a measure of the relative heating value and burning characteristics of the various fuels when burned in domestic heating furnaces where attendance is comparable to that given ordinarily. In all, 184 different shipments of coals, of which 172 were from various mines in this country, were burned in four low-pressure heating boilers, and 534 individual tests were made. The coals tested included anthracite, semi-anthracite, semi-bituminous, bituminous, sub-bituminous and lignite. A few coals from British Columbia, China, Japan, Australia and New Zealand were tested.

This bulletin gives to manufacturers and distributors of heating boilers and to heating engineers, contractors and users of such equipment, the following information:

It compares the average operating efficiencies to be expected from boilers of the type and size tested when a wide variety of kinds and grades of coal is used, and it shows how the average efficiencies of the boilers are related to such main characteristics of coals as moisture, ash, fixed carbon, volatile matter, and size.

Technical data and burning characteristics are presented regarding domestic furnaces of coals from all parts of the country; it also gives the average efficiency obtained with each coal. From these facts can be judged the conditions heating boilers will have to meet in the various states.

The average overall efficiency from all the tests was 58% for an average rate of output of 65,700 B. T. U. per hour, which is sufficient to heat 262 sq. ft. of steam radiation. The average coal burned per hour was 2.8 lbs. per sq. ft. of grate surface.

The hot water boilers gave 3% higher efficiency than the steam boilers. The boiler having generous grate, combustion space, and heating surface gave 4% higher efficiency.

The highest efficiencies were obtained with anthracite but were lower than they should be, due to high ashpit loss. The semi-bituminous coals gave a lower efficiency than the bituminous coals, because of the high ashpit loss. If the ashpit loss is neglected, the efficiency of boiler and furnace shows a slow but constant increase from the sub-bituminous coal to the semi-anthracite, and the increase then becomes rapid. The ashpit loss increased with the percentage of ash in the coal from about 3% with no ash to about 7% with the highest ash for the bituminous coals. The loss was higher with the anthracite than with the bituminous coals.

The average overall efficiency was independent of the moisture content. This is equivalent to saying that the coals high in moisture had other characteristics that offset the loss due to the moisture.

The average overall thermal efficiency was independent of the calorific values of the coals. One can interpret this as meaning only that the combustible part burned as efficiently when associated with high as with low ash content. The dollar value of the coals depends upon the calorific value and is proportional to the calorific value multiplied by the overall efficiency.

Full details of these experiments are given in Bureau of Mines Bulletin 276, "Five Hundred Tests of Various Coals in House-Heating Boilers," by P. Nicholls, S. B. Flagg, and C. E. Augustine, which can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per copy.

Unusual Building Construction and Heating System

by **PETER H. BRYCE, M. D.**

A DWELLING having 30,000 cu. ft. of content, built of insulating material, was described by the writer in an article in THE HEATING AND VENTILATING MAGAZINE, for July, 1927. An addition to this building has now been erected containing 17,000 cu. ft. of contents, with a music room and flower room on the ground floor, two bedrooms and bath on the upper floor, and a basement devoted to coal storage and a boiler room.

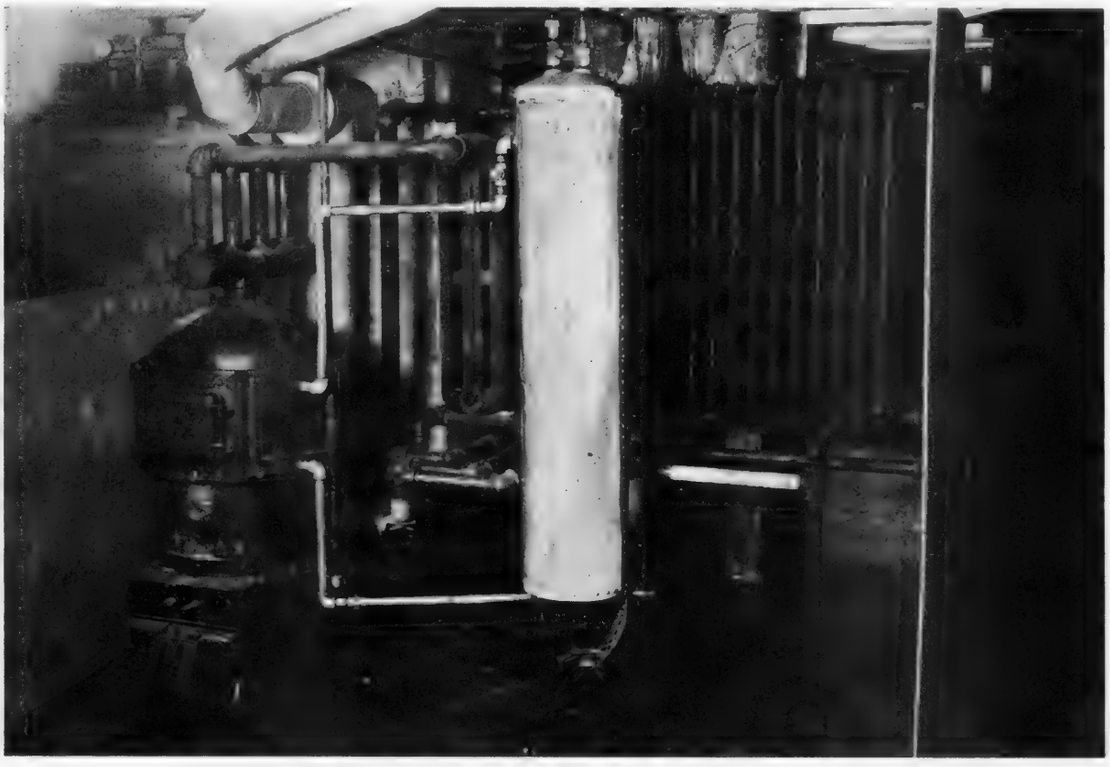
For some years I have believed that a strong, non-conducting wall could be built cheaply by utilizing 4 in. round, hollow field tiles, placed on end in two rows and setting the whole in cement. In order to ascertain whether this idea was sound, a test was made by the Dominion Government Public Works Department. Four 4 in. round tiles 12 in. long were placed within a 12 in. square, on which were placed four similar tiles set in concrete with all the spaces surrounding the tiles filled with concrete. At the end of a month a crushing test was applied, and it was found that 129,000 lbs. were required to break down the contents of the box. Furthermore, after having been erected only five days, two rows of tiles 3 ft. high were removed to reconstruct a window and it required a strong man with a sledge more than 1 hr. to break down the tile.

An excavation for a 7 ft. basement was then made, and a wall footing 20 in. wide and 6 in. deep and a tile drain on the outside of the wall, were laid. A number of 2 in. by 4 in. ducts was then placed every 3 ft. around the 20 ft. by 24 ft. space, and tongue and grooved sheeting used as forms.

Since I could build only as the wall rose, the hollow tiles were set on end on the foundation after the first two rows of horizontal sheeting were in place. It required some little practice to get the whole space around the tiles, set ½ in. apart, filled completely with concrete, but the workmen soon became proficient so that they mixed and laid in a 9-hr. day, five rows or 120 cu. ft. of straight wall.

In a 12 in. space, two rows of 4 in. field tile, staggered in the row, occupied just 10½ in. of width, which left an inch of solid concrete on the outside of the tiles, and ½ in. on the inner side. To carry out the idea of a complete dead-air space in the wall, the tile was filled at the top with excelsior rolled into a ball. This not only formed a dead air space but served to keep the concrete from falling into the lower tile as the next row was being set.

The wall was duly completed and finished both outside and inside with a coating of magnesite stucco. To complete the construction, a wooden cross-wall was built between the flower room and music room on a



Enclosed Chamber in which Air Is Heated for Distribution to the Rooms

Modernistic Lines Obtained by Exposed Field Tiles Above Fireplace

concrete partition in the basement.

The accompanying photograph shows the mantelpiece and fireplace, which were the most difficult parts of the construction. It became a pleasing idea to utilize the field tiles to make a fluted wall to close in a chimney space, shown on the left side of the mantel. I then conceived the idea that by a similar use of tiles I could make a warm-air duct to convey heat to the bedroom floor, so by keeping the two tile ducts 2 ft. apart a space was formed into which could be placed an electric grate, and at the same time allow a duct behind it to carry warm air from the basement room into the music room.

A small dome heater was placed in the basement near the chimney, and close to it three large hot water radiators elevated 30 in. from the floor to insure a perfect return circulation. A 40 gal. hot water tank for the bathroom supply was then attached to the boiler. This whole system was then enclosed in a 6 ft. by 8 ft. space, built in with Gyprock sheeting, which formed an excellent non-conducting wall. A 2-in. main with return was carried to a large radiator placed under the window in the south of the flower room.

The heat from this chamber was distributed to the music room by a 6 in. by 20 in. duct and a straight duct, 12 in. by 12 in., leading to the register in the upper floor wall. The latter was placed horizontally under the partition so that both bedrooms could be heated.

A register 8 in. by 8 in. was placed at the farther side of the music room in the floor, from which a 7-in. duct was led straight to the hot air chamber. This acted as a cold air return.

Heat was supplied to the bathroom by utilizing the space around the tile pipe in the wall. Leading from the bathroom to the basement, the space was connected by a 7-in. duct to a thimble around the smoke pipe at the chimney. Thus so long as there is heat in the stove pipe, warm air for the bathroom is steadily supplied.

This Type Construction Makes Dry Walls

The walls, both as to the strength and non-conducting qualities, are not damp, and in the basement, where there is little heat, the wall is extremely dry. The same is true in the upper rooms where the inner coat of stucco has been long drying out during a wet summer.

The dome boiler is only 16 in. in diameter, and is best suited for chestnut coal, but I have succeeded in utilizing stove coal, built on a wood fire, and then placing Welsh anthracite, of buckwheat size, on top. The temperature is readily maintained at 68° to 70° throughout the house. The air flow from the heating chamber keeps constant at about 150 cu. ft. per min. A similar rate is found in the duct to the upper rooms.

Heat Transmission Committee Reports

In the first progress report it has made this year, an account of several new projects is issued by the Committee on Heat Transmission, National Research Council, 40 West 40th St., New York. Test codes on insulation have been published as well as a directory of experimental research in educational institutions. Since the last meeting a sub-committee under chairmanship of J. D. Keller, of the Carnegie Institute of Technology, has been formed to deal exclusively with heat transfer by radiation. A bibliography has been compiled on this subject by the sub-committee.

Fellowships for the study of heat transmission between fluids have been established at Harvard and Cornell universities. At Massachusetts Institute of Technology a fellowship has been awarded for the study of heat transmission by radiation from luminous and non-luminous flame. This fellowship extends over two years, has been awarded to C. H. Gilmore, and is under supervision of Prof. H. C. Hottel, of the Institute.

Window Ventilation Championed in U. S. P. H. Report

Another broadside from the window-ventilation enthusiasts has been published in the form of a report by Leonard Greenburg, assistant sanitary engineer, U. S. Public Health Service, in Public Health Reports for February 8, 1929. That school children who attend mechanically-ventilated schools tend to be absent more often from classes than children who attend window-ventilated schools because of respiratory diseases, is the conclusion of the report which is based on a study of the relationship between types of school ventilation and respiratory illness in certain schools in New Haven, Conn.

Covering a period from January 3, 1926, to April 1, 1927, data regarding total absences from class, temperature, and three-day absences due to respiratory diseases, were obtained from teachers and the board of health in independent surveys. Fourteen tables show the data.

Quoting from Tables 1 and 2, the figures for absences on the basis of total pupil sessions are 6.2% from four schools mechanically ventilated and 3.9% from schools window ventilated. Percentage of total absences because of three or more days' absences due to respiratory diseases is 57.8% in mechanically-ventilated schools, and only 30.8% in window-ventilated schools.

The report acknowledges the varying influences of such factors as age, sex, class in school, nationality of parents, and then states, "it will be observed that the mechanically-ventilated schools have higher rates of illness in all grades than the naturally (window) ventilated schools in the corresponding grades."

In conclusion, the report finds that, "absences of a duration of three days or more amounted to 359 in the mechanically-ventilated group (of schools) as compared with 133 in the window-ventilated group. From these data it appears reasonable to conclude that the atmospheric conditions produced by the systems of mechanical ventilation in use at the time of the study were associated with the higher respiratory illness absence rates. These studies, however, should certainly not be interpreted as condemning all mechanical systems of air conditioning."

Universities and Schools in which Courses in Heating and Ventilating Are Included in the Curricula

Name of School or College	*Name and Number of Study*	*Course*	*Remarks*
Agricultural and Mechanical College of Texas	316—Mechanical equipment of buildings. Heating and ventilating, water supply, plumbing and sanitation, and acoustics.	Dept. of Architecture	Required of Architects
	509—10 Graduate courses relating to heating and ventilating, water supply and waste disposal for buildings.	Graduate School	For graduates in the Dept. of Architecture
Alabama Polytechnic Institute	ME445—Heating and ventilating. Methods; designs; relative efficiencies of different systems of heating, etc.	Mechanical Engineering	1st semester. 2 hrs.
American School	Heating, ventilating and plumbing, the sanitary field. Proper systems of heating and ventilating; their manufacture, maintenance and installation.	Correspondence Course in Heating and Ventilating	Home study course
Armour Institute of Technology	MEXII—Heating and ventilating. 30 lectures and recitations covering the elementary study of heat, heat losses, theory of combustion, radiation, piping systems, boilers, principles of ventilation, design of various types of heating systems, temperature regulation.	Special Evening	For artisans, apprentices, students in manual training and those who have neither the time nor education for regular university work.
	Heating and ventilating.	Fire Protection Engineering; Architecture	For college grade day classes. A general course, 1 1/3 credit hrs. Part of the required work in the two courses listed.
Bucknell University	ME204—Heating and ventilating. Study of various methods of direct and indirect heating calculations and drawings for assigned buildings required.	Mechanical Engineering	Required 2nd term, 4th year. 4 hrs.
Carnegie Institute of Technology	1-509—Heating and plumbing requirements. Amount of heat for different types of buildings, heating and ventilating systems; fixtures and installations.	Dept. of Building Construction	1st semester, 6 units, prerequisite is knowledge of plumbing and sanitary codes.
	1-511—Equipment testing. Plumbing, heating and ventilating systems now on the market.	Dept. of Building Construction	Junior, 1st semester.
	1-512 and 1-513—Building sanitation. Arrangement of ventilation and sanitary equipment in buildings, sub-soil drain, etc.	Dept. of Building Construction	1st and 2nd semesters.
	1-514—Air conditioning. Determining requirements, state and city laws, temperature controls, etc.	Dept. of Building Construction	2nd semester.
	1-516—Heating. Ventilating systems, fans, blowers, exhausters, etc.	Dept. of Building Construction	2nd semester.
	1-527 and 1-528—Heating and ventilating ducts. Methods of determining size of sheet metal ducts to carry air, rotary syphon and belt type ventilators, etc.	Dept. of Building Construction	1st and 2nd semesters. Sheet metal senior option.
Case School of Applied Science	242—Heating, ventilating and refrigeration. Study of heating with live and exhaust steam, hot water; district heating; mechanical ventilation; air conditioning; refrigeration. Laboratory work includes design of heating and ventilating systems, and visits to typical installations.	Mechanical Engineering	Senior year, 1st term, 3 hrs. of lectures, 3 hrs. lab. and design. Part of the required course.
Clarkson College of Technology	ME422—Heating and Ventilating. Study of various types of warm-air, hot water and steam heating systems; ventilation and air conditioning.	Mechanical Engineering	Hoffman's Handbook for heating and ventilating engineers used as a basis.
	ME423—Heating and ventilating. Application of gas engines to the design of a heating system for a private residence, and heating and ventilating of a public building.	Mechanical Engineering	3 hrs.
Colorado Agricultural College	ME722w—Heating and ventilating. Principles of the various methods of heating and ventilating in modern buildings.	Mechanical Engineering	Required of M.E. in senior yr. 3 hrs.
Cornell University	ME373—Heating, ventilating, and refrigeration. Lectures and recitations covering the methods of design and construction of various types of heating, ventilating and refrigeration equipment.	Mechanical Engineering	Required of seniors in M.E., first term.
Georgia School of Technology	ME61—Heating and Ventilating. Heat loss; systems of heating; ventilation instruction.	Mechanical Engineering	Juniors M.E. Summer Term
	ME68—Refrigeration, heating and ventilating. Complete study of compressors, condensers, heat transfer, and theory of heating and ventilating.	Mechanical Engineering	Senior M.E.
International Correspondence Schools	Plumbing, heating and ventilating.	Complete Heating Complete Ventilating courses included	Heating and ventilating given in short courses as well.
Iowa State College	ME411—Heating designing. Air requirements, heat losses, heating systems, location of apparatus, layout of piping. Laboratory and recitation.	Mechanical Engineering and Architectural Engineering	Elective, 3 hrs.

Name of School or College	*Name and Number of Study*	*Course*	*Remarks*
	ME418—Heating and ventilating. Ventilation, air washing and moistening, heat losses; hot water, hot air and steam systems. Heat control. Recitation.	Mechanical Engineering and Architectural Engineering	Elective, 2 hrs.
	ME493—Factory planning. Selection of machinery, heating and ventilating apparatus and power equipment.	Mechanical Engineering	Elective, 3 hrs.
	ME514—Air conditioning. Ventilation, air washing, humidifying, cooling and drying. Legislative requirements.	Mechanical Engineering	Elective, 3 to 5 hrs.
	ME544—Industrial Heating. Study of modern practice, as determined by building construction and special requirements; exhauster and drying systems. Plans and specifications.	Mechanical Engineering	Elective, 3 to 5 hrs.
	ME574—District heating. Choice and location of plant; steam and hot water. Design of distributing systems. Detailed plans and specifications.	Mechanical Engineering	Elective, 3 hrs.
Kansas State Agricultural College	ME210 and 215—Refrigeration, heating and ventilating. Fundamental principles of heating, ventilating, and refrigeration.	Mechanical Engineering	Allen & Walker's Heating and Ventilation, and notes on refrigeration. Used as basis.
Massachusetts Institute Technology	59—Mechanical equipment of buildings, heating and ventilating. Includes a study of the elementary principles of thermodynamics and a study of the principles of heating and ventilating in particular.	Building Construction Architectural Engineering	Required in the senior year of courses mentioned.
	854—Mechanical equipment of buildings. Heating and ventilating taken only incidentally.	Mechanical Engineering	Required for those taking the 3a textile option of mechanical engineering.
Michigan State College of Agriculture and Applied Science	418a—Heating and ventilating. Principles involved in heating buildings by steam, hot water and hot air; ventilation and control of temperature.	Mechanical Engineering	Required of seniors in M.E.
	418e—Heating and ventilating. Similar to 418a.	Mechanical Engineering	Required of seniors in C.E., sanitary and M.E.
New York University	HV-E4—Heating and ventilating laboratory. Covers a study of all types of devices, apparatus and fittings used in heating and venilating. Practice is given in testing heating and ventilating equipment, including radiators, traps, boilers, fans and complete heating systems.	Heating and Ventilating, evening course, 3 years	Part of the regular 3-year evening course in heating and ventilating engineering. Leads to a certificate of proficiency. Applicants should have 2 yrs. of high-school training. Designed for those employed by engineers and architects. 3 hrs.
	HV-E5—Principles of heating and ventilating design. Computations, study of types of heating systems, and auxiliary equipment.	See above	See above. 1 1/2 hrs.
	HV-E6—Application of heating and ventilating design. Complete layouts are made by the student in this course, including a heating system for an office and an air-conditioning system for a theater.	See above	See above. 3 hrs.
	BC-E1—Mechanical equipment of buildings. All phases of mechanical equipment, including heating and ventilating.	Short course in Building Construction, evening class	2 hrs. For those employed in architects' offices and draftsmen, etc.
North Carolina State College of Agriculture and Engineering	ME303—Heating and ventilating. Principles of heating and ventilating. Warm-air, steam and hot-water, methods of ventilation.	Mechanical Engineering	Required of seniors in mechanical engineering and industrial management.
Ohio State University	ME551—Heating and ventilating. Elementary study of machinery, apparatus, and appliances.	Architectural Engineering	2-hr. course for non-M.E. students, 1st term, 4th yr.
	ME572—Heating and ventilating. Design, layout and testing of equipments.	Architectural Engineering	4-hr. course for non-M.E. students, Winter quarter, 4th yr.
	ME605—Heating and ventilating. Descriptive and analytical study of apparatus, machinery and layouts.	Industrial Engineering Mechanical Engineering	4-hr. course, Indus. Engr., Winter quarter. 4th yr. M.E. and Spring quarter 3rd year M.E.
Oregon State Agricultural College	ME225—Elementary heating and ventilating systems for the home: comparison of systems; study of fuels, combustion, draft, radiation, etc.	Architectural Engineering	Elementary course, 2nd term elective.
	ME461—Heating and ventilating. Methods, computations, systems, designs, constructions, and operations.	Mechanical Engineering	Advanced course. 3rd term for M.E. seniors.
Pennsylvania State College	ME9—Heating and ventilating. Methods of heating and ventilating are investigated to determine efficiency and economy.	Mechanical Engineering	1st and 2nd semesters. For Architectural Engrs., Industrial Engrs., and Mechanical Engrs.
	ME111—Heating and ventilating. Methods of heating and ventilating in respect to efficiency, economy, sanitary conditions and their relations to architectural design.	Architecture	3 hours, 1st semester. Required of seniors.
Polytechnic Institute of Brooklyn	ME795—Heating and ventilating. Heat loss; properties of steam; properties of air and ventilation, etc. A practical course in heating and ventilating layouts.	Mechanical Engineering	For Industrial Engineers. Evening course, 2 hrs. a week, one semester.

Name of School or College	*Name and Number of Study*	*Course*	*Remarks*
Pratt Institute	Power and industrial plants. Mainly takes up all phases of heat engineering and power plant practice. It also includes the essentials of heating and ventilation, with instructions for the calculation of radiation.	Industrial Mechanical Engineering	Fall and Spring of second year of the intensive 2-yr. course.
Purdue University	ME125—Heating and ventilating.	Mechanical Engineering	First semester senior year, optional M.E.
	ME126—Heating and ventilating. (Continuation of ME125). These courses take up the fundamental principles of heating and ventilation, leading up to the design of all types of equipment. Special attention is paid to cost and efficiency.	Mechanical Engineering	Second semester senior year, optional M.E. 2 hrs. Two additional courses are available for students who have completed 125 and 126. These provide for detailed individual instruction.
	ME188—Heating and ventilating design.	Mechanical Engineering	First semester senior year, optional M.E.
	ME189—Heating and ventilating design. (Cont. of ME188). These courses, which must be taken in connection with ME125 and ME126, take up the design of heating equipment and plants from an actual survey made by the student.	Mechanical Engineering	Second semester senior year, optional M.E.
Rochester Athenaeum and Mechanics Institute	Heating and ventilating.	Co-Operative Mechanical Course	Part of the third-year work in the three-year course at this institution; the work at the institute alternates by months with work at various Rochester, N. Y., industries.
Rose Polytechnic Institute	Heating and ventilating. Heat loss from buildings, ventilation, radiating surfaces, steam and hot water pipes, air ducts, fans and heaters, devices for heating systems.	Mechanical Engineering	1st term of senior year, two credits.
	Mechanical equipment of buildings. Continuation of above. Further work in heating, air conditioning and refrigeration.	Mechanical Engineering	2nd term of senior year, 2 credits.
St. Louis Technical Institute	II-A—Heating and ventilating engineering studies. Practical warm-air furnace heating, design of all fittings, mensuration, physics, furnace and fan calculations and layout. Warm-air furnace code, actual plans. Steam and hot-water fitting, piping, boilers and furnaces, physics, steam and water heating, steam and water system design, indirect heating, ventilating ducts, air conditioning, temperature control, exhaust and blow pipe engineering.	Correspondence course in Heating and Ventilating	Home study course for artisans, estimators, etc., engaged in heating and ventilating.
	II-B—Special warm-air heating course. Takes up essentially that part of course II-A that deals with warm air.	Correspondence course in Warm-Air Heating	Home study course for artisans, estimators, etc., engaged in warm-air heating.
	II-C—Special steamfitters course. Takes up essentially that part of course II-A that deals with hot-water and steam fitting.	Correspondence course in Steam and Hot Water System Design	Home study course for artisans, estimators, etc., engaged in steam and hot water design and instruction.
	II-D—Heating and ventilating business management. Takes up the estimating and design features of course II-A, but includes studies of auditing, management, business economics, salesmanship, advertising, etc., that are not included in II-A.	Correspondence course in Heating and Ventilating, Shop Management and Business	Home study course for owners and executives of heating and ventilating shops.
Syracuse University	HP7—Heating and ventilating. Designs of heating systems; ventilation; drying materials; refrigeration machinery.	Mechanical Engineering	Required of seniors in mechanical engineering.
	Arch. 62—Heating and ventilating. The principles of heating and ventilation and their application to warm air, steam and hot water installations as are called for in general practice. Layout and specifications required.	Architectural Engineering	Required of seniors in 4-year and 5-year courses and of freshmen in 2-year certificate course. One semester.
Tufts College	ME55-44—Heating and ventilating. Calculation of heat losses, direct and indirect steam and hot water heating systems, gravity returns, furnace heating, ventilation and air conditioning, etc.	Mechanical Engineering	3-hr. course, 1st semester.
The University of North Carolina	93abcs, 194abc, Eng.—Mechanical engineering laboratory. Course for graduate M.E. students covering special experimental investigations in heating and ventilating, heat power and refrigeration.	Mechanical Engineering (Graduate)	3 1/3 to 10 semester hours.
University of California	CE125—Sanitation of buildings. Water supply drainage, heating, ventilating, and lighting of buildings.	Civil Engineering	Either semester, for juniors in household art.
University of Illinois	ME23—Mechanical equipment. Heating and ventilation, refrigeration, fire protection, etc.	Mechanical Engineering	For seniors only. Required of architectural engineers, mechanical engineers.
	ME25—Heating and ventilating for architects. Direct and indirect heating, air analysis and conditioning.	Mechanical Engineering	For seniors in architecture.
	ME28—Heating and Ventilating. Steam boilers, water heaters; direct and indirect heating; gravity systems; district heating; ventilation and air conditioning and analysis.	Mechanical Engineering	For seniors in mechanical engineering.
University of Maine	ME02—Heating and ventilating. Heat resistance of building materials, heat losses through walls, windows, etc., heating, ventilating and humidification systems.	Mechanical Engineering	2 hrs.

Name of School or College	*Name and Number of Study*	*Course*	*Remarks*
University of Michigan	ME25—Heating and ventilating. Theory, design and installation of warm air, hot water, steam and vapor heating systems; central heating; air conditioning. Lectures and recitations.	Mechanical Engineering	2 hrs. second semester, senior year, optional.
	ME25a—Design of heating and ventilating systems. Student is given usual data given engineer, selects type of system, lays it out, and makes computations for principal parts.	Mechanical Engineering	3 hrs. second semester, senior year, optional.
	ME18—Heating and ventilating. Elementary theory; design and construction of hot air, direct and indirect steam, hot water and fan heating systems. Lectures and recitations.	Architects only	2 hrs. first semester.
	ME45—Studies in natural ventilation. Theory of air movement through buildings by wind and temperature difference. Deductions from test data at hand. Some experimental work of an illustrative nature, and possibly something of a research nature.	Mechanical Engineering	2 hrs. second semester.
University of Minnesota	ME63—Heating and ventilating. Principles of heating and ventilating. Furnaces, steam, vapor, hot water, vacuum and fan systems of heating. Pipe sizing. Ventilation, synthetic air chart. Humidification. Central station heating.	Mechanical Engineering	Required course for Junior Mech. Engrs. Spring term. 3 hrs. of recitation and lectures.
	Ag.E.36—Rural heating and ventilating. Fundamental principles of combustion, heat transmission and heating and ventilating, and the application of heating and ventilating to rural homes, schools and churches, and farm structures.	Agricultural Engineering	Optional course for junior and senior Agricultural Engineers. 4 hrs. Also open to junior and senior engineers of other schools; Arch. Engrs., Mech. Engrs., Civil Engrs., etc.
	ME163—Heating and ventilating. Principles and layout of all types of heating and ventilating systems for architectural engineers.	Architectural Engineering	4 hrs., Fall quarter, senior year required for Arch. Engineers.
	ME164—Heating and ventilating. Principles of heating and ventilating, including temperature regulation. For architects.	Architecture	2 hrs., lectures, required course for senior architects, Spring quarter.
	ME165—Advanced heating and ventilating. Advanced course to cover special problems as selected.	Mechanical Engineering	3 hrs., for senior or graduate students who have completed course M.E.63.
	ME265—Advanced heating and ventilating. Special course for graduate students who are doing research work in the laboratory at the same time.	Mechanical Engineering	Time to be arranged. Open to graduates only.
	ME267—Mechanical equipment of buildings. Selection of heating, ventilating, and plumbing systems for various types of buildings.	Mechanical Engineering Architectural Engineering	3 hrs., optional, open to junior and senior engineers who have completed M.E.-163. Especially for Arch. Engrs.
University of Nebraska	ME128—Mechanical equipment of buildings. The design of all types of heating and ventilating systems; fire protection, sewer systems, wiring, etc.	Mechanical Engineering	Senior year, 2 hr. option, 2nd term, M.E. students.
	ME129—Mechanical equipment of buildings. Theory and design of heating and ventilating equipment and other mechanical apparatus of buildings.	Architectural Engineering and other engineering except M.E.	Senior year, either term, 4 hrs. for architects and 3 hrs. for engineers.
University of Washington	ME107—Heating and ventilating. Abridged course for architects.	Mechanical Engineering	Optional course for architects.
	ME182—Heating and ventilating. Heating and ventilating systems of methods and designs.	Mechanical Engineering	For mechanical engineers course given in the Autumn and Winter.
University of Wisconsin	Steam and gas engineering, 108—Heating and ventilating. General course covering the principles and theory of modern heating and ventilating systems. Steam and gas engineering, 110—Advanced course for those enrolled in 108. 128—Heating and ventilating laboratory. Elective for those completing 108. Calibration of heating and ventilating instruments, tests of unit heaters, etc.	Mechanical Engineering	3 hrs. senior option, either semester. This university has heating and ventilating equipment available for almost any type of experiment. An air conditioner in the laboratory is capable of washing, cooling, humidifying, or dehumidifying the air. Apparatus is installed for the study of air infiltration. A Thomas meter is available for air flow measurements.
	Heating and ventilating. A general correspondence course, given by the extension division of the university.	Correspondence	For adults seeking instruction in the elementary and vocational subjects, as well as for those in candidacy for degrees from the university.
	223M—Heating and ventilating. Treats on heat, heat losses, heating systems, fuels and combustion, boilers, radiation, ventilating systems, plans and specifications, testing heating systems, etc.	Milwaukee Extension Course	This is an evening course for architects, engineers, draftsmen, estimators, and others who need a practical course to help them in their work.

Name of School or College	*Name and Number of Study*	*Course*	*Remarks*
Virginia Polytechnic Institute	436—Heating and ventilating. Engineering principles involved in heating and ventilating; steam and mechanical appliances in connection with equipment of buildings.	Seniors in Mechanical Engineering and Architectural Engineering	3 hrs. Lectures, discussions and recitations. 2nd quarter.
	516-526-536—Mechanical equipment of buildings. The applications of the principles of mechanics and mechanical engineering to the selection, arrangement and installation of the mechanical equipment of modern buildings.	Graduate students in Architectural Engineering and Mechanical Engineering	3 hrs. Lectures and assigned problems. 1st, 2nd and 3rd quarters.
Washington University (St. Louis)	ME46—Heating and ventilating.	Mechanical Engineering	Elective senior year for mechanical engineers.
Yale University	ME151a—Heating and ventilation study of the ventilation and warming of buildings, including district heating and problems and laboratory exercises.	Graduate, Mechanical Engineering (Graduate School)	Recitation, 2 hrs., Lab. 2 hrs. For graduate students in Mech. Engineering only, first semester. It is also available to special undergraduates who have taken the undergraduate course in this subject.
	ME40a—Heating and ventilating. Study of the general principles of heating and ventilating buildings, with general applications.	Mechanical Engineering Civil Engineering Electrical Engineering Industrial Engineering of the Yale College Sheffield Scientific School	Recitation, 2 hrs. Lab., 2 hrs. For seniors of the four mentioned schools. First term. Optional.

Heat Loss Constants Determined in Great Britain

Thermal Conductivities of Walls, Concretes and Plasters is the subject of a building research paper (Technical Paper No. 6) prepared by Ezer Griffiths, D.Sc., F.R.S., for the Department of Scientific and Industrial Research, London. The paper essentially is a reprint of Special Report No. 7 (Heat Transmission Through Walls, Concrete and Plasters). Specimen walls of 9 sq. ft. area and sample slabs of various plasters and concretes, 12 in. by 12 in. by 2 in. in size, were constructed under the supervision of the technical staff of the Building Research Board and tested with a simple hot-plate apparatus. In some of the experiments a guard ring was fixed around the hot plates.

Detailed figures for typical experiments illustrate the procedure followed in making the tests. The paper includes a table of heat transmission coefficients for a number of typical walls, such as "one-brick" walls, "cavity" walls, composite wa'ls and Pise walls, also the thermal conductivities of concrete plaster and other materials.

Typical of the coefficients obtained were 0.80 B.T.U. for sand-lime bricks on edge, two thicknesses with headers spanning cavity (Fig. 1), and 0.820 B.T.U. for walls of 12 in. by 9 in. by 6 in. hollow terra cotta bricks (Fig. 2). A wall of timber frame construction, ¾ in. weatherboarding, 1 in. rough boarding, 4 in. by 2 in. studding and lath and plaster (Fig. 3) showed a coefficient of 0.40 B.T.U.

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Identification of Piping Systems

Announcement has been made of a plan employing color and other kinds of markings for the identification of piping systems, and approved by American Engineering Standards Committee. Presented as "Recommended American Practice," the plan was developed by the Sectional Committee on the Identification of Piping Systems consisting of thirty-three members. It is sponsored by the National Safety Council and the American Society of Mechanical Engineers.

The plan has been limited to the identification of piping systems in industrial plants and power plants, not including pipes buried in the ground and electric conduits. The basic idea is to make recognizable, instantly, the distinction between safe and unsafe materials. Methods of identification are two. At conspicuous places pipes shall be painted in one of the five color groups classifying the material contained within as dangerous, safe, protective, fire protection, and extra valuable. Basic colors for these five groups are, respectively, yellow, green, blue, red, and purple. In addition, the actual contents of a piping system may be stenciled by full or abbreviated name on the colored bands.

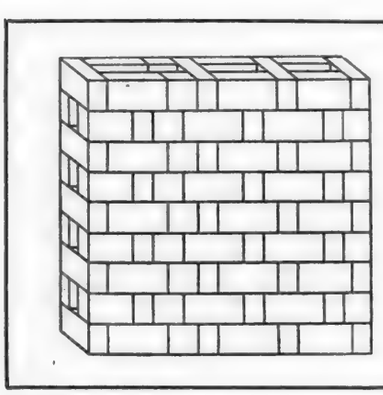


Fig. 1. Test Wall of Sand-Lime Bricks

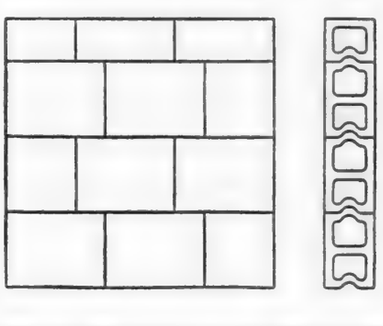


Fig. 2. Test Wall of Hollow Terra Cotta Bricks

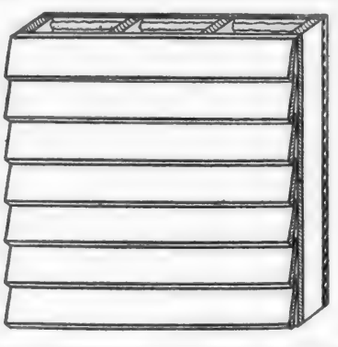


Fig. 3. Test Wall of Frame Construction

The Frost Research Laboratory, Norristown, Pa.

New Organization Promotes Use of Anthracite

ANNOUNCEMENT was made in August of the organization of the Anthracite Equipment Corporation, which will finance and promote the sale of improved heating and heat control devices. It will interest itself initially in distribution of such appliances as have been tested and approved by the research laboratory of the Anthracite Operators Conference.

The following were elected to the board of directors: Eliot Farley, president, D. L. & W. Coal Company; A. J. Maloney, president, Philadelphia and Reading Coal and Iron Company; Daniel T. Pierce, vice-chairman, Anthracite Operators Conference; Thomas Dickson, of Dickson & Eddy, and C. A. Connell, acting manager, Anthracite Coal Service. Daniel T. Pierce was elected president and A. S. Moody secretary and general manager.

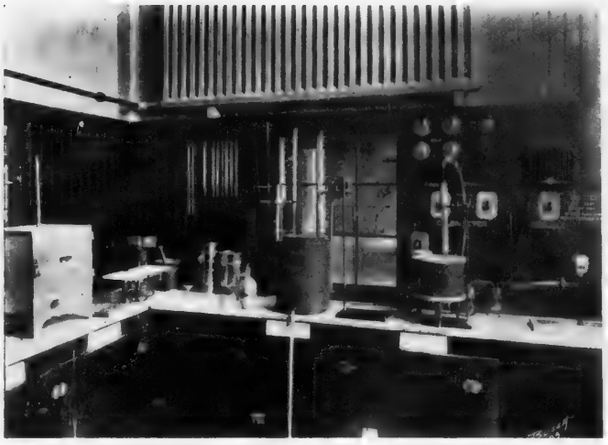
Aroused to the needs of the coal-burning public, various groups interested in the production and sale of anthracite and anthracite burning equipment, have formed five distinct organizations in the last three years. The Anthracite Operators Conference was begun two years ago and its membership consisted of mine operators only. A second organization, subsidiary to the conference, also was formed two years ago for the purpose of aiding dealers, training dealers' salesmen, and distributing helpful information to the consumer through the dealer. This was named Anthracite Coal Service. Another organization was formed for the purpose of obtaining and disseminating statistical information to the operators. The latter organization is known as the Anthracite Bureau of Information.

Research constitutes still another important activity of the Conference. Following a meeting of operators and engineers, all experts in their various lines, held at Lehigh University last winter, Horace C. Porter, formerly with the Bureau of Mines at Washington, was selected to recommend lines of research to be followed, and the Frost Research Laboratory, at Norristown, was chosen as the place where the experimental work would be conducted.

Nearly a dozen automatic stokers and controls now are being tested in the laboratory at Norristown. Three detailed reports have been made public and as a result of improvements suggested and made, the public soon will be able to make a choice of one of several appliances which will heat their homes at a low cost.

Among the appliances now under test is one which, when burning No. 1 buckwheat, has demonstrated that the owner can practically ignore the heating plant for a week at a time. The fuel is fed through an automatic feeder, the coal coming directly from the coal bin and the ashes deposited in cans convenient

General View of Boiler Test Room, Frost Research Laboratory



Calorimeters for Fuel Analysis, Frost Research Laboratory

One Corner of Boiler Test Room Is Used for Calibrated Boiler Feed Water Tanks

for removal. In this particular instance it is necessary to sink the ashpit below the level of the cellar floor.

Another appliance under test is one that provides for the burning of chestnut or larger sizes of coal by magazine feed. This is still in its experimental stage but the prospects are excellent.

Other devices being experimented with include the Wedge stoker with vertical steel tubular boiler and revolving grate, Fahnestock experimental overfeed stoker; Auburn underfeed stoker; American Engineering Company stoker; Electric Furnace Man; Motor Stokor; Auto Coala Stoker, and the Allen Air appliance to lift ashes.

In connection with the development of mechanical stokers, Mr. Frost stated: "The transition in stoker application now is rapidly approaching. This transition is destined to exert a profound influence upon the anthracite industry, reaching back and affecting the methods of coal preparation. From observation of similar developments in heating and household appliances over the past decade, the swing to stoker firing can be expected as a reality in a comparatively few years."

Mr. Frost stated that tests extending over several weeks have proved that a stoker equipped with a proper boiler can be operated over its entire range of capacities at efficiencies of 80% on buckwheat coal. This stoker can be controlled by thermostat, thus making it automatic with the exception of the amount of labor required for removal of ash.

The laboratory now is working upon an ash removal system that already has been proven practical but is undergoing further refinement before it is placed before the public as a marketable product. The laboratory buildings are located on a hill far above the business section of Norristown. It is the largest institution of its kind devoted to the solution of heating problems and the only commercial laboratory for heating research outside of those at technical schools. The buildings occupy a ground area of 6000 sq. ft. and are two stories in height with a basement under the entire structure, and are admirably equipped.

The new equipment corporation will use the information and data obtained from the laboratory and develop merchandising outlets for such equipment as stokers, anthracite burning coal, etc. It is expected that the expansion of the organization's interest in promoting the use of anthracite will have a far reaching effect in increasing the consumption of this fuel.

Columbus Successfully Combats Smoke Nuisance

Satisfactory progress toward the elimination of all unnecessary smoke has been the gratifying result of a year's work on the part of progressive citizens of Columbus, O. Prior to January, 1928, Columbus had considered the smoke problem and had attempted to combat it. Results were largely unsuccessful, however, largely because of lack of proper support.

About eighteen months ago, a number of public-spirited individuals and organizations took up the question seriously. The resulting publicity brought pressure to bear on the city government and, finally, a smoke abatement ordinance was passed by the city council.

Later a Smoke Abatement League was formed by prominent citizens. Since then, this organization has backed up every effort of the city smoke inspector, with advertising in the press and radio, and educational drives.

Columbus investigated the sources from which comes excessive smoke. In order of importance they were found to be private warm-air furnaces, office buildings, industrial and power boilers, and railroad locomotives. All office, factory, and apartment owners have been asked to cooperate. In all cases, home-owners, janitors and firemen have been asked to cooperate.

Since October, 1928, firemen to the number of 361 have been instructed in the best methods of firing their present boilers, mixing of fuels of high and low volatile content, and the proper care of fires. 1486 plant inspections have been made. During the period since October, 1928, new installations, partly due to educational drives and publicity, have included 679 new oil and gas burners, 140 automatic stokers, 63 steam air jets, while plants using mixed coal have increased by 81.

The work of the Smoke Abatement League mainly has been educational. It has engaged J. J. McDowell as engineer to cooperate with home-owners, city officials, and commercial users in the drive to make Columbus smokeless.

Anthracite Club Formed in New York

A new organization recently was formed in New York under the title of The Anthracite Club, organized to bring about more complete cooperation between those interested in coal-burning heating equipment.

The constructive program adopted by the organization will include instructions in the proper methods of burning coal, educational marketing, an effort to reduce anthracite prices and the formation of an appliance division to work with manufacturers of heating devices.

The officers are: President, Oscar F. Ostby, vice-president, Domestic Stoker Company; vice-presidents, Albert F. Duemler, New York manager, Anthracite Service; D. H. Faulkner, New York manager, H. B. Smith Company; secretary, Noel Cunningham, Domestic Stoker Company; treasurer, W. L. Burnside, eastern sales office, D. L. & W. Coal Co.

Additional Market Data—Domestic Oil Burners

LAST month HEATING AND VENTILATING presented data pertaining to the distribution of domestic oil burners by states in relation to the population of those states. The tabulation below shows the distribution of burners in connection with the number of wired homes, the number of owned homes, and the percentage of the total income tax. The last indicates, to an important extent, the buying power so far as luxuries are concerned.

Some interesting comparisons of states in the same geographical sections can be made from these data. In general, the distribution seems to be in proportion to the income tax returns and the number of owned homes, but there are several exceptions. For example, while Wisconsin has but an eighth more wired homes than Minnesota, and has a two-thirds higher percentage of income tax, Wisconsin has oil burners in only 3% of its wired homes, while Minnesota has a percentage of 5.8%.

It was shown in last month's issue, Page 83, that Rhode Island has an unusually high percentage of oil burners considering its population. This also is true in connection with the number of wired homes, the percentage of wired homes having burners being 8%, while Massachusetts and Connecticut each have but approximately 2%.

	Number of Wired Homes *	Number of Oil Burners Jan. 1, 1929 **	Number of Owned Homes ***	Percentage of Total Income Tax Returns 1928 ****	Per Cent Domestic Oil Burners **
Alabama	136,230	343	172,363	0.3	0.081
Arizona	37,990	4	33,075	0.1	0.001
Arkansas	97,150	685	171,253	0.2	0.162
California	1,397,900	6115	382,834	6.1	1.46
Colorado	160,250	127	116,781	0.4	0.030
Connecticut	352,790	7010	115,181	2.0	1.67
Delaware	28,830	38	22,829	0.9	0.009
District of Columbia	101,595	6840	28,503	0.9	1.62
Florida	184,410	25	94,990	0.9	0.006
Georgia	146,120	106	188,185	0.5	0.025
Idaho	64,180	0	59,208	0.0	0.0
Illinois	1,501,450	91,236	658,260	8.6	21.6
Indiana	532,520	13,652	395,402	1.1	3.23
Iowa	334,800	5000	332,567	0.4	1.187
Kansas	268,600	1140	241,456	0.4	0.269
Kentucky	194,040	914	275,993	0.5	0.216
Louisiana	109,460	6850	126,410	0.4	1.62
Maine	135,132	2880	108,829	0.4	0.68
Maryland	251,290	734	159,262	1.4	0.173
Massachusetts	945,096	22,690	301,245	5.1	5.39
Michigan	866,610	14,430	499,471	4.5	3.42
Minnesota	393,440	22,690	312,367	0.9	5.39
Mississippi	55,600	1643	132,900	0.1	0.388
Missouri	565,250	54,350	401,667	1.8	12.9
Montana	71,070	347	81,840	0.1	0.082
Nebraska	178,520	33,005	169,098	0.2	7.82
Nevada	12,390	0	9938	0.0	0.0
New Hampshire	96,420	1142	52,278	0.2	0.27
New Jersey	872,050	13,600	271,914	4.5	3.24
New Mexico	23,890	245	48,152	0.0	0.058
New York	2,977,426	57,845	738,738	35.4	13.7
North Carolina	171,750	68	235,842	0.6	0.016
North Dakota	55,125	0	84,904	0.0	0.0
Ohio	1,273,330	7010	719,097	4.2	1.67
Oklahoma	211,160	1690	193,840	1.0	0.399
Oregon	204,650	228	108,772	0.3	0.054
Pennsylvania	1,673,000	15,954	853,471	9.5	3.78
Rhode Island	150,990	11,800	41,921	0.7	2.81
South Carolina	94,800	1600	108,179	0.1	0.378
South Dakota	55,940	364	84,712	0.0	0.086
Tennessee	172,750	410	241,875	0.5	0.097
Texas	537,150	2288	421,875	1.9	0.539
Utah	100,830	47	57,985	0.1	0.011
Vermont	62,150	912	48,370	0.1	0.216
Virginia	199,520	228	242,062	0.4	0.054
Washington	339,700	456	183,322	0.4	0.108
West Virginia	130,450	114	141,362	0.4	0.027
Wisconsin	456,040	13,655	371,822	1.4	3.24
Wyoming	30,830	4	24,060	0.1	0.001

* From *Electrical Merchandising*, January, 1929.
** An approximation based on distribution of burners estimated from consumption of fuel oil, American Oil Burner Association.
*** From report published by Bureau of Census, 1920.
**** From *New York Times*, January 28, 1929.

Fuel Oil Specifications Accepted by Industry

Announcement has been made by the Bureau of Standards, Department of Commerce, that the Fuel Oil Standards, prepared by the American Oil Burner Association, in cooperation with other interested bodies, officially have been listed as the Commercial Standards for Domestic and Industrial Fuel Oils, effective July 18.

A few minor changes have been made in the specifications as printed in HEATING AND VENTILATING last year. The changes include a change in nomenclature, numbers 1, 2 and 3 now being known as Light, Medium and Heavy Domestic Fuel Oils rather than Furnace Oils, and numbers 4, 5 and 6 as Light, Medium and Heavy Industrial Fuel Oils, instead of Light, Medium and Heavy Fuel Oils.

Maximum pour point has been raised from 0° F. to 15° F., for the domestic fuel oils with the qualifying note that: "Lower or higher pour points may be specified whenever required by conditions of storage and use. However, these specifications shall not require a pour point less than 0° F. under any conditions."

Acceptance of the specifications marks the successful conclusion of the move to standardize the types of fuel oils initiated in 1923, when the American Oil Burner Association was formed. The association, in cooperation with the American Petroleum Institute and the American Society for Testing Materials, in 1927, prepared and compiled data from which the specifications were formulated and officially accepted by the association in April, 1928.

Last December the specifications were submitted to the Department of Commerce. A conference attended by representatives of all branches of the industry was held in January, 1929. Since that time signed acceptances have been received from a sufficient number of manufacturers, refiners, distributors and users, to insure the general adoption of the standard by the industry as a whole.

Legal Decisions

Tenant's Rights on Landlord's Failure to Furnish Heat

In an action for the rent of a leased apartment for the month of April, 1925, the lease expiring April 30, the tenant claimed that he was not liable for the rent of that month, since he had been constructively evicted on March 19, when he moved out because of the alleged lack of heat and hot water, paying the rent to April 1. The Illinois Appellate Division said, Kain v. Slyde, 246 Ill. App. 26, that on the evidence, if the court believed the defendant's testimony, it would have been warranted in holding that he might legally have vacated the premises during the months of November, December, January and February, but he did not vacate during these months. His testimony as to March merely indicated that on March 7 the temperature in the apartment was 59° at 10 P.M. The court stated:

"The law has long been firmly established in this State (Illinois) that a tenant may abandon the premises where the landlord fails to furnish heat as required by the lease. But to relieve the tenant from the payment of rent he must vacate the premises. There cannot be a constructive eviction without surrender of the premises. It is also the law that where a tenant fails to surrender possession after the commission of acts by the landlord which would justify the tenant in abandoning the premises, he will be deemed to have waived such right and will be liable for the rent at least during the time he occupies the premises. It is also the law that where the landlord fails to furnish heat as required by the lease and the temperature is such that the tenant would be warranted in vacating the premises, the tenant is not obliged to vacate at once, but is entitled to a reasonable time after such breach; and what is a reasonable time is generally a question of fact and while it is generally a question of fact whether the tenant vacated the premises within a reasonable time after breach by the landlord, yet such question may be a question of law where all reasonable minds reach the conclusion that the time was unreasonable."

Having paid the rent for the months up to February, it was held that the tenant waived any right to vacate the premises on account of lack of heat during these months. The evidence as to the temperature of the apartment in March was meagre; and there was no evidence that after the 7th he did anything to secure another apartment, except that he moved out on the 19th. Whether he was warranted in vacating the apartment during March, and whether he acted with that diligence which the law requires, the court was unable to say in the absence of any evidence on these points. The burden being on him to make such showing and he having failed to do so, judgment for the defendant was reversed and the cause remanded.

Conflicting Evidence as to Contract for Installation of Oil Burner

In an action against a contractor for the balance of the price of an oil burner installed by the plaintiff in the residence of a third party under an alleged oral contract, the evidence as to the making of the contract conflicted. The plaintiff testified that the contract was made as alleged, the burner installed and that the owner of the house gave him a check for $400 on account of the price of $550, in which the general contractor (defendant) was made payee, but that the defendant refused to endorse it, and he obtained a second check from the owner, payable to himself, and cashed it. The defendant and his manager denied making the contract or meeting the plaintiff until the burner was being tested. The owner testified that he employed the defendant to put in a coal-burning heating system under a written contract, and this was put in; that subsequently plaintiff heard that he was interested in a certain oil-heating system, and that one day he came home and found plaintiff's men putting an oil tank in his yard; that he dismissed the men, but they came back next day, when he was away, and put in the tank without his knowledge; that he remonstrated with plaintiff who told him that he would remove the oil burner if it did not work satisfactorily; that, in his opinion, if any one owed any balance, he was the debtor and not the contractor; that he had understood from plaintiff when he paid him that the $400 covered the entire cost.

The Louisiana Court of Appeals held, Louisiana Oil Burning Equipment Co. v. McGregor, 118 So. 833, that the act of the owner of the house in permitting his yard to be torn up and an oil burner installed without authorization on his part was unbusinesslike and unusual, but the plaintiff's claim was supported only by his testimony while the defense was supported by the testimony of the defendant and his manager, and also indirectly by the owner of the premises and the manner of payment of the $400.

Article 2277 of the Louisiana Revised Civil Code provides that contracts for the payment of more than $500 shall be proved by at least one witness and other corroborative circumstances. In this case the contract was for more than $500 and there was only one witness, without any corroborative circumstances except, possibly, the installation of the heater which was in part explained by the owner of the premises. The court applied the rule that a judgment on questions of fact will not be reversed unless there is manifest error, and affirmed judgment for the defendant.

Selling Agent's Guarantee of Heating Plant Held for Jury

In an action to recover the cost of a heating system, sold and delivered to the defendant, the defense was that it failed to give the results guaranteed. The guarantee relied on was written on the seller's stationery by its selling agent in a number of letters, which the defendant claimed stated would remedy the defects already existing in the heating system of his sanitarium and would heat the building. The plaintiff denied the existence of the guarantee and the authority of the selling agent to give it, if one was given. The defendant claimed that the agent's guarantee had been ratified by the plaintiff's subsequent conduct. After the installation was made, the defendant wrote to the plaintiff at its principal office and stated that arrangements had been made with the agent and the guarantee that he had furnished. The plaintiff's answer made no denial of the guarantee, nor of the agent's power to make it, but a number of representatives from its plant were sent to inspect the operation of the heating plant. There was no question that the materials furnished did not produce the result that was promised. The Pennsylvania Superior Court held, 90 Pa. Superior Ct. 23, that, since there was evidence to prove the guarantee and the agent's authority to make it, the case was for the jury, and it was not error for the trial court to refuse to enter judgment in favor of the plaintiff in spite of verdict for the defendant.

Barlum Tower, Detroit

Operating Data for Large Office Buildings

RECORDS covering two years' operation of the heating system in the Barlum Tower, in Detroit, made by M. M. Apple, operating superintendent, illustrate the possibilities in the economical heating of such a structure.

As Mr. Apple tells the story in "The Superintendent," for August, 1929, the official publication of the New York Building Superintendents' Association:

I took charge of the Barlum Tower, a forty-story office building, located at the corner of Cadillac and Bates Sts., Detroit, Mich., as operating superintendent, August 1, 1927. This building was just being completed, and a Dunham Differential heating system had been installed.

In the following paragraphs, I will give a brief outline of the operation of this system during the heating seasons in 1927-28—1928-29.

Our building has forty stories of rentable area, is 100 ft. square, and exposed on all sides, with the exception of thirteen stories on the west. Steam is supplied from the central heating company's mains, at 30 to 35 lbs. pressure. It is reduced to the pressure or vacuum desired by passing it through subatmospheric reducing valves and then to main steam riser as illustrated in Fig. 2. The vacuum pump connections are typical for a duplex pump installation.

As shown in the illustration, the discharge from these pumps is piped to a vented surge tank from which the condensate flows by gravity to the economizer to reduce the heat in the condensate, as much as possible, before it is metered and discharged to the sewer.

The condensate from the service water heaters returns to a separate meter so as to get exact records of steam used for hot water and heating.

In Fig. 1 is shown in elevation a simple layout of the steam distribution system. It consists of three separate circuits, one down-feed system for the upper twenty stories, one down-feed system for the twentieth to third floors, inclusive, and an up-feed system for the first and second floors.

There are 300,750 sq. ft. of rentable area in the building, which is 75% of the gross area. The total cubage is 4,440,000 cu. ft. with 48,000 sq. ft. of radiation.

Some very rigid tests have been made in the past two heating seasons. I have in my office, on the fifteenth floor, recording instruments showing vacuum on supply and return lines, also outside and inside temperatures. The inside temperature is taken by a recording thermometer with a gas-filled thermoid 150 ft. long, which is run through a series of offices where the radiation has been balanced with other parts of the building.

One of the first things we learned in operating this system was that we were turning the steam on earlier each morning than was necessary. This fault was due to past experience with older type systems which were very sluggish and slow in circulating.

By starting the vacuum pumps about one-half hour ahead of the steam a vacuum of 20 to 21 in. will build up in the system, this producing very rapid circulation. Due to this, we have been able to raise the temperature of the building 18° to 20° in 1 hr. and 30 min. Stop and figure what this one point alone will save over just one heating season.

Can you control your steam temperature, so that you do not overheat under any conditions and still get complete circulation throughout your system?

A glance at Figs. 3 and 4 will give you an idea of the control available with the system. These tests were made at two extreme conditions.

Fig. 3 shows conditions with 0.4 lbs.

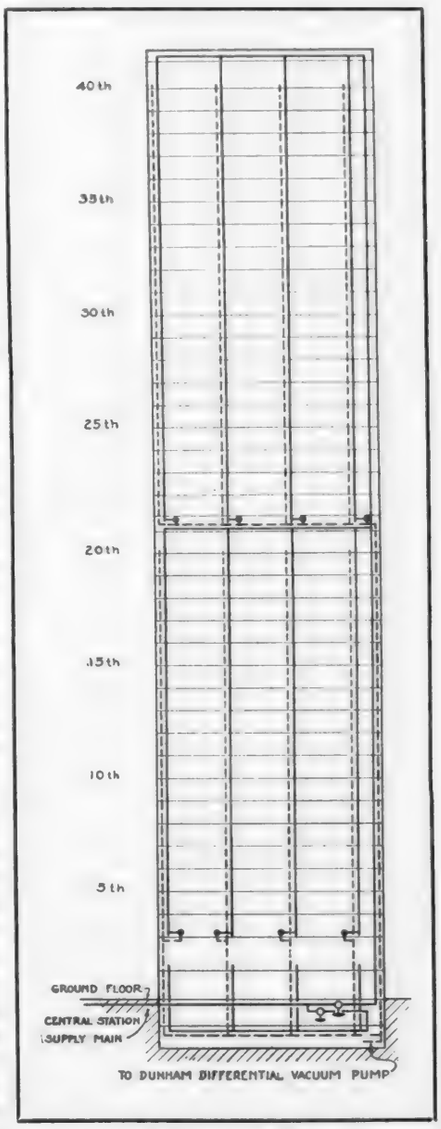


Fig. 1. Elevation Showing Risers

pressure on supply and 19.4 in. vacuum on return. This condition obtains only during the heating up period.

Fig. 4 shows conditions with 19.8 in. of vacuum on supply and 20.4 in. on return. This gives only 0.6 in. differential with a condensate rate of 0.04 lbs. per sq. ft. of radiation per hour. This test was made with an outside temperature of 34° F., room temperature 71°.

Later in the heating season, when outside temperatures were ranging from 45° to 60° F., I have operated with 23 in. vacuum on supply and 24 in. on return with only 1 in. differential on the system, this condition giving circulation throughout the system.

In the above tests mercury columns were used for determining pressures and differentials, and thermocouples and galvanometers were used to determine temperatures. All condensate was measured with a special meter.

The accompanying records give operating conditions from month to month from Sept. 12, 1927, to June 12, 1929.

MEAN TEMPERATURE FOR MONTH
U. S. BUREAU, DEG. F.

	1927	1928	1929
September	67.2	60.8	
October	50.8	49.0	
November	38.5	37.1	
December	29.8	29.3	
January		27.6	21.0
February		25.9	27.8
March		40.7	46.9
April		47.9	45.5
May		58.9	56.2

MEAN TEMPERATURE FOR
HEATING SEASON, DEG. F.

1927-28	1928-29
43+	41.5

RADIATION IN USE, PER CENT.

	1927	1928	1929
September	60	80	
October	60	80	
November	70	80	
December	80	85	
January		85	100
February		85	100
March		80	100
April		80	90
May		80	90

STEAM CONSUMPTION FOR
HEATING ONLY, POUNDS

	1927-28	1928-29
September	151,900	327,200
October	927,000	1,057,400
November	1,650,700	1,760,500
December	2,391,300	2,233,300
January	1,982,200	2,780,600
February	2,094,000	2,283,100
March	1,351,400	966,400
April	926,100	945,300
May	198,800	319,300
	11,673,400	12,673,100

DEGREE-DAYS (70° BASIS)

	1927-28	1928-29
September	127	295
October	428	458
November	794	830
December	1,227	1,154
January	1,350	1,492
February	1,248	1,313
March	1,123	878
April	783	602
May	359	455
	7,439	7,501

HEATING HOURS

	1927-28	1928-29
September	46.0	97.0
October	204.0	290.0
November	322.0	367.0
December	394.0	401.0
January	427.5	433.5
February	389.0	383.5
March	382.0	310.5
April	259.5	291.5
May	40.0	108.5
	2,464	2,682

CONSUMPTION PER HEATING
HOUR, POUNDS

	1927	1928	1929
September	3,302	3,373	
October	4,544	3,646	
November	5,126	4,797	
December	6,069	5,569	
January		4,637	6,414
February		5,383	5,953
March		3,537	3,117
April		3,568	3,242
May		4,970	2,943

DEGREE-HOURS DURING
OPERATING PERIOD

	1927-28	1928-29
September	220	1,086
October	4,324	6,670
November	10,787	12,808
December	16,626	17,122
January	18,981	22,108
February	17,932	16,950
March	11,956	7,781
April	6,254	7,724
May	524	1,714
	87,604	93,963

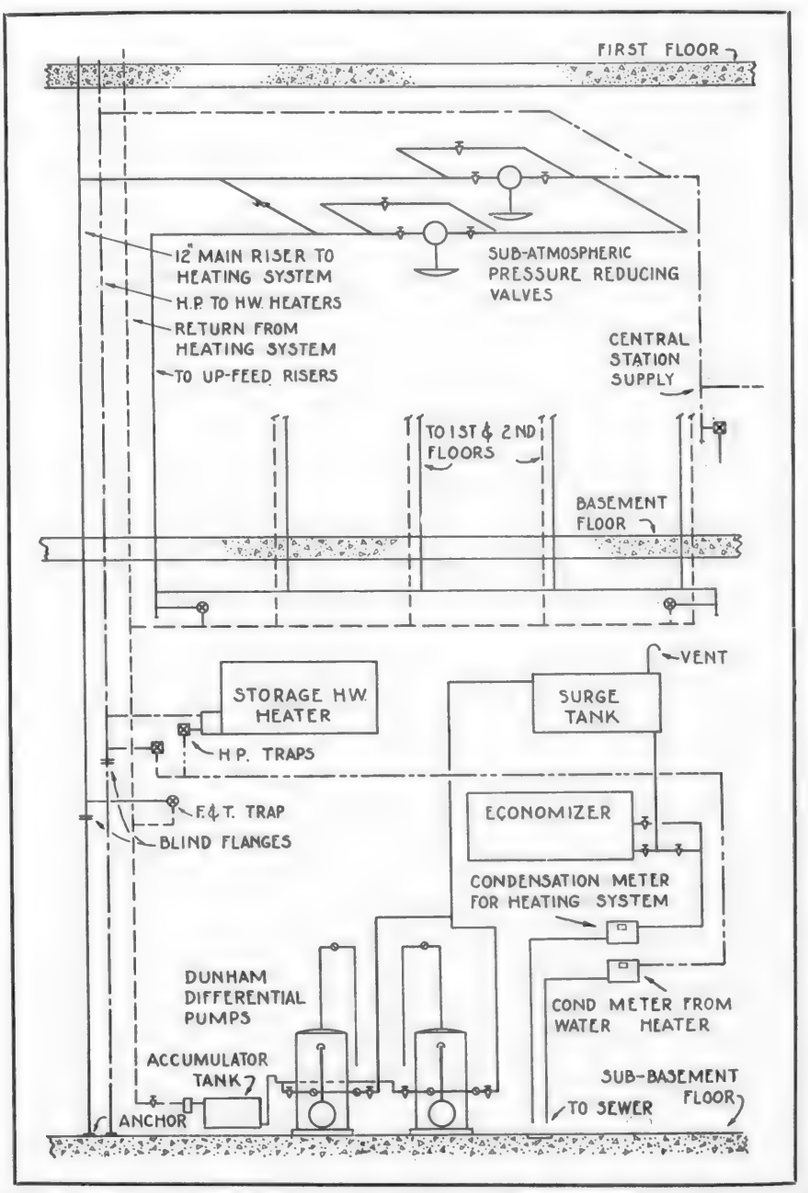


Fig. 2. Elevation of Sub-Basement and Basement, Showing Heating Equipment

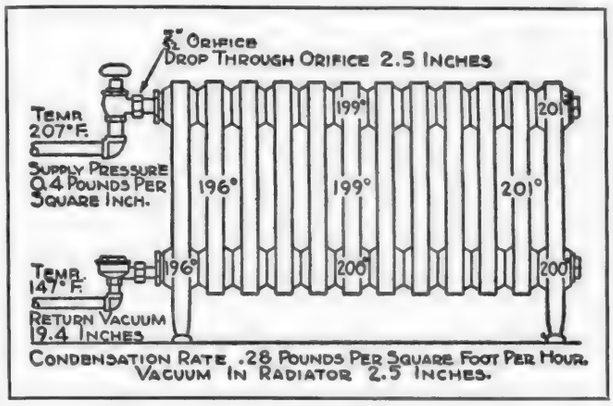


Fig. 3. Conditions in Radiator During Heating-up Period

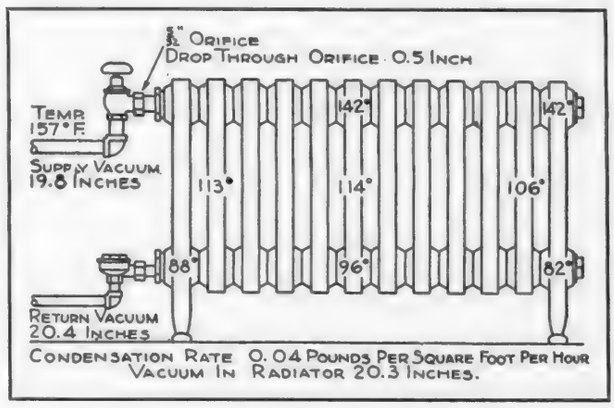


Fig. 4. Temperature in Radiator with 0.6 In. Differential Between Return and Supply

CONSUMPTION PER SQ. FT. OF RADIATION IN USE PER DEGREE-HOUR

	1927	1928	1929
September	.0237	.0078	
October	.0074	.0041	
November	.0046	.0036	
December	.0037	.0032	
January		.0026	.0026
February		.0029	.0028
March		.0030	.0026
April		.0039	.0028
May		.0099	.0043

STEAM CONSUMPTION IN POUNDS PER SQUARE FOOT OF RADIATION IN USE PER HEATING HOUR.

	1927	1928	1929
September	.1146	.0878	
October	.1577	.0949	
November	.1572	.1249	
December	.1581	.1365	
January		.1136	.1336
February		.1319	.1240
March		.0921	.0649
April		.0929	.0750
May		.1294	.0681

Some have the idea that operating with high vacuum increases the maintenance cost, but this is not true. Any vacuum return-line system requires a certain amount of maintenance if it is kept in the proper condition. Too often small leaks develop in systems and are ignored until so many have developed that it becomes almost impossible to heat. This is not the case when operat-with this system. As soon as a leak develops you know it by the action of your gauges, especially if you are using recording gauges. A great deal of labor is saved by taking care of the small leaks as they develop. Another very important feature is that it shows immediately when a drip trap is blowing through.

It is a general practice of engineers to increase the radiation on the upper floors of the taller buildings, but I find that this is wrong, due to the action of the draft in these cases. Starting at the ground floor there is an in-draft which gradually drops off as you go higher in the building. At some point about half way up (this will vary in different buildings) this draft becomes neutral and from that point on the draft is out instead of in. This condition makes the upper floors much easier to heat than the lower floors.

You will note in Figs. 3 and 4 that there is a regulating plate, having an orifice, in each radiator valve. The greater majority of the radiators in this system have 42 sq. ft. of radiation each, and regulating plates designed to take care of 31 to 40 sq. ft. of radiation were installed in each valve.

Tests made during the past heating season, from the 20th to 40th floors show that by taking out the 31 to 40 regulating plates and replacing these with 21 to 30 will overcome the condition of overheating in the upper floors, due to the draft condition of the building, as explained in a preceding paragraph. Regulating plates marked 21–30 have a smaller orifice than those marked 31–40. By reducing the area of the orifice the steam flow is reduced. By doing this, I will be able to operate on even less consumption than shown in the foregoing figures.

We have at no time, even in sub-zero weather, had to operate our system at full capacity. With the high vacuum and differential control we have been able to maintain an even temperature without overheating at any time.

Business Law for Engineers

The purpose of "Business Law for Engineers," by C. Frank Allen, is as mentioned in the preface "not to make every man his own lawyer, but rather to give the engineer a sufficient understanding of the important fundamental features of law, so that he may have some idea of when and how to act himself and when to seek expert advice, as well as to enlarge his horizon and perhaps encourage him to further study of law."

Part I speaks of the elements of law for engineers, while Part II is devoted to contract letting. Among the subjects treated in Part I are contracts, equity, real property, corporations, agency, sales and the engineer's legal relations with others.

Contract letting, Part II, speaks of advertisements, information for bidders, uniform contract forms, additional contract forms, cost plus contracts, specifications, etc. Permission has been granted to the author to include the Cost-Plus form devised by the American Institute of Architects, and the addition of the chapter on cost plus contracts is one of the principal reasons for issuing the third edition.

Mr. Allen is a member of the American Society of Civil Engineers, Massachusetts Bar, American Railway Engineering Association, and formerly was professor of railroad engineering at the Massachusetts Institute of Technology. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York. Price $4.

New Gas House-Heating Rates in Philadelphia

Announcement recently was made by Conrad N. Lauer, president of the Philadelphia Gas Works Company, that a gas house-heating rate of 75 cents per thousand cubic feet has been approved by the City's Gas Commission, effective September first.

The new rate will be available to home and other building owners along the company's mains. The gas will be supplied through a separate meter under a special house-heating contract.

The contract calls for the use of gas for house-heating from October till May, inclusive, at a minimum charge of $150 for the period, or $18.75 per month, which is the cost of 200,000 cu. ft. of gas for the season at the 75-cent rate, or 25,000 cu. ft. a month.

There are now approximately 1300 gas-heated homes in Philadelphia, and under the new rate these customers will be benefited to the extent of more than $100,000 a year.

B. T. U. Club

Every reader of HEATING AND VENTILATING, *whether a subscriber or not, is a member of this club. There are no initiation fees or dues. There is not even a constitution. The club functions as a forum or round table for the informal discussion by our readers, particularly the younger men in the industry, of topics in which they are interested, provided only that such topics pertain directly or indirectly to heating and ventilation. If you prefer, your name will not be used.*

Sounds and Vibration from Oil Burners

MR. CHAIRMAN:

The writer was interested in the remarks of Dean Bliss, in the April issue of THE HEATING AND VENTILATING MAGAZINE, concerning the present status of domestic oil burning, and particularly in his answer to question No. 4, relating to the matter of noise. This matter has recently been called to my attention through personal experience with an oil burner installed in my own home and supplemented by numerous reports of similar installations.

In what follows, there is no intention of criticism and the items mentioned are given simply as suggestions, which might help in other cases when there was a tendency to excessive vibration. There are three characteristic noises, which may come from a mechanical oil burner, as follows: (1) the roar of combustion, (2) a humming or sustained musical sound, due to vibration of various parts of the equipment, and (3) a rumble, caused by vibrations being transmitted from the machine to the concrete floor of the basement. In some cases, all three of these are present, and of sufficient intensity to be distinctly annoying in the rooms above, while in others, only one or two may be audible.

In my own installation, all three had to be contended with. At the start, it seemed that the burner was operated at a higher capacity than was necessary, and that the high speed and resulting pressures were greater than should be carried on a machine designed for domestic purposes, where quietness of action is an essential factor. Under these conditions, a white hard flame was produced, causing a roaring which could be heard throughout the entire apartment. When the burner was automatically turned on by the room thermostat the temperature of the water would run up quite rapidly until the maximum was reached for which the heater thermostat was set. It would now stop for a short time until the water cooled a few degrees and then start up again, thus repeating the operation at frequent intervals until the normal room temperature was reached.

By substituting a tip with a smaller orifice for oil in the burner and cutting down the air supply correspondingly by an improvised gate in the blast pipe, a smaller and softer flame was secured, which not only did the work quietly but being more nearly proportioned to the normal load, operated with greater steadiness. This particular burner was not provided with means for easily adjusting the oil and air supply, which seemed to me a serious defect. While such adjustments should not be so conveniently made as to allow tampering by incompetent persons, variations in type and size of fire box, strength of chimney draft, size and exposure of rooms to be heated, and other similar factors, call for special adjustment in each individual installation to obtain the most satisfactory results.

The next difficulty in the case under consideration was a humming or musical note due to the vibration of the oil tank, which was located in the basement and connected with the burner by a feed pipe laid in the concrete floor. When standing beside the tank the noise was similar to that of a small planing machine, while in the rooms above it sounded more like an airplane passing over the house at a high altitude. While this varied more or less in intensity at different times, it was practically constant when the machine was running, and very annoying. Investigation showed this to be primarily due to an excessive vibration of the relief valve at the oil pump, which was in turn transmitted to the tank through the feed line.

The first attempt to stop this was the introduction of a short length of reinforced rubber hose in the feed pipe. This eliminated the difficulty for a short time but the rubber soon hardened and transmitted the vribrations as readily as the metal. Next, a separate line was carried from the relief valve, so that the excess oil was discharged back into

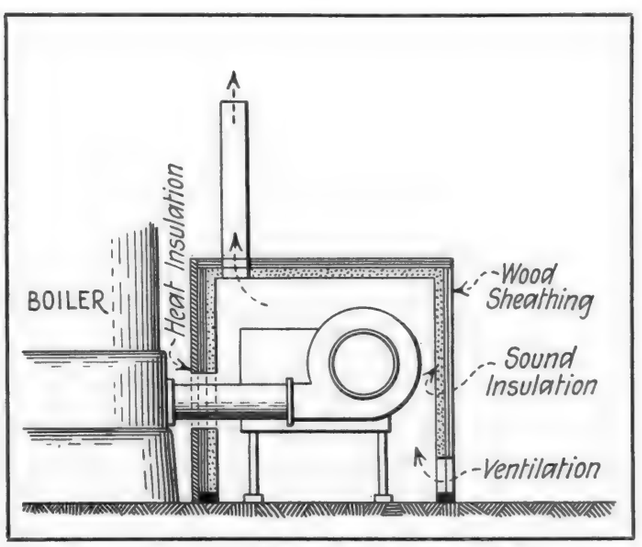


Fig. 1. Sound-Insulating Housing for Oil Burner

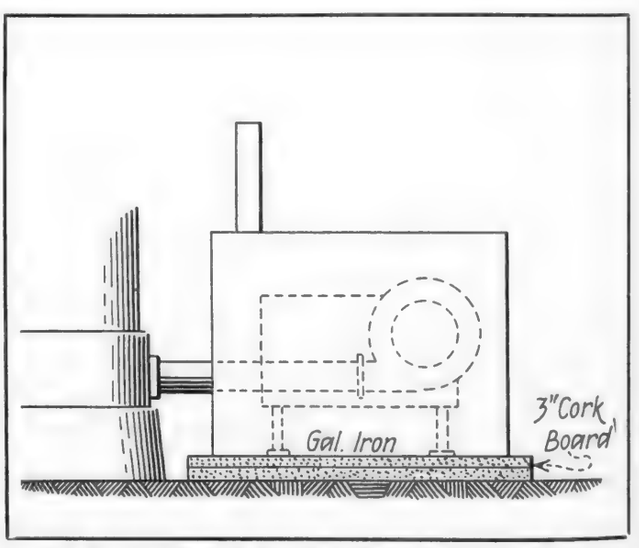


Fig. 2. Cork Board Insulation Under Enclosed Burner

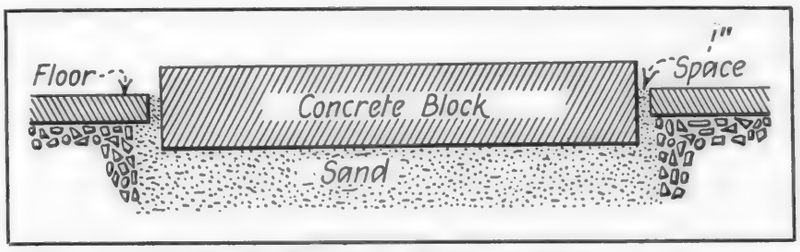


Fig. 3. Foundation for Heavy Burners

the tank instead of into the pump suction, but this had no appreciable effect upon the vibration. Finally, a box was built around the tank and filled with sand. This ended the difficulty so far as the vibration of the tank itself was concerned. Another method of securing the same result would be to cover the tank with 2 or 3 in. of plastic or block insulation, which would give a neater appearance.

Although the above proceeding eliminated the noise from the tank, there still remained sufficient vibration at the valve and in the short connections to the pump to produce a similar musical tone, which was audible in the rooms above, but not so loud as before. It was found that this could be reduced to a negligible quantity by placing a wooden housing over the burner and Fig. 1 is given as a suggestion for a permanent sound insulation for this purpose. Aside from the relief valve and tank, there is likely to be more or less humming from high speed motors, blowers and oil pumps, so that the arrangement shown in Fig. 1 might prove desirable in other cases. Such a housing should be fireproof and provided with ventilating openings in order to prevent overheating.

It has been suggested that the entire apparatus, including the heater, be placed in an insulated room. While this may be advisable under certain conditions, particularly when there is excessive roaring from combustion, it would not seem necessary when the flame can be softened by proper adjustment of the oil and air. In this case it is only necessary to insulate the burner.

As regards vibration, it is best to eliminate as much of it as possible at the source, by using a properly designed relief valve and then adjust the capacity of the oil pump more nearly to the requirements of the burner, so as to reduce the excess to be passed through the relief valve to a minimum. By throttling the valve in the oil supply pipe to the pump to a point where but little excess passed through the relief valve, all vibration of both valve and tank was stopped. The rumbling noise referred to was due to the vibration of the machine being transmitted to the concrete, particularly over the buried pipes leading from the oil pump and relief valve. A suggestion for eliminating this in case of light equipment is illustrated in Fig. 2 and consists in placing 2 or 3 in. of cork board beneath the base, the top being covered with a sheet of galvanized iron for protection against oil. For heavier machines, a foundation similar to that shown in Fig. 3 can be employed. This is made of concrete resting upon a bed of sand, with space between the concrete and the floor.

CHARLES L. HUBBARD

Jamaica Plain, Mass.

Eye Protection and the Welding Operator

A bulletin dealing with eye protection for the welding operator has been issued by the Policyholders' Service Bureau of the Metropolitan Life Insurance Company, New York, under the title "Safety in Welding." The following comments, abstracts from the bulletin, tells of the various methods of protecting the eyes of the welder and bystanders from the dangerous rays given off by the different types of welding flames and arcs:

Welding processes may be placed in two groups as far as the effects of radiant energy are concerned.

1. Processes requiring only a moderate reduction of visible radiant energy, such as oxyacetylene and oxyhydrogen welding and cutting, and electric resistance welding.

2. Processes necessitating a large reduction of visible radiant energy—electric arc welding and cutting.

For the protection of eyes from ultra violet rays, black, amber, green and greenish yellow glasses are best, especially greenish yellow.

For protection against infra red rays, deep black, yellowish green, sage green, bluish green and gold plated glasses are best.

For intense radiance the darkest glasses possible should be used; black, green and yellowish green, as these not only cut down the light, but protect from both ultra violet and infra red rays.

The *National Safety Code for the Protection of the Heads and Eyes of Industrial Workers* specifies that for the first group goggles, face masks, helmets and shields are permitted. The goggles may be of the rigid, non-adjustable bridge type, with or without side shields, or with flexibly connected lens containers shaped to conform to the face. In either case, a heat insulating material should be used on all parts that touch the skin to avoid burning. Goggles should be made of material capable of being cleansed and sterilized.

Face masks or helmets of standard type may be used. Regardless of type of goggle or shield, the lenses, should not transmit more than 1 per cent of radiant energy of any wave length less than 406 millimicrons, and not more than 50 per cent of the total radiant energy from the standard source.

For the second group, only the helmet or the hand shield are permissible, as goggles do not give sufficient protection. The lenses should transmit not more than 1 per cent of the radiant energy of any wave length less than 406 millimicrons, not more than 1 per cent of visible light, and less than 10 per cent of total radiant energy.

In all welding operations, particularly where the electric arc is used, care must be taken to protect the welder from reflections of the arc from side walls, and *persons working near-by* must be protected. Where welding is done routinely indoors, booths should be provided for each welder.

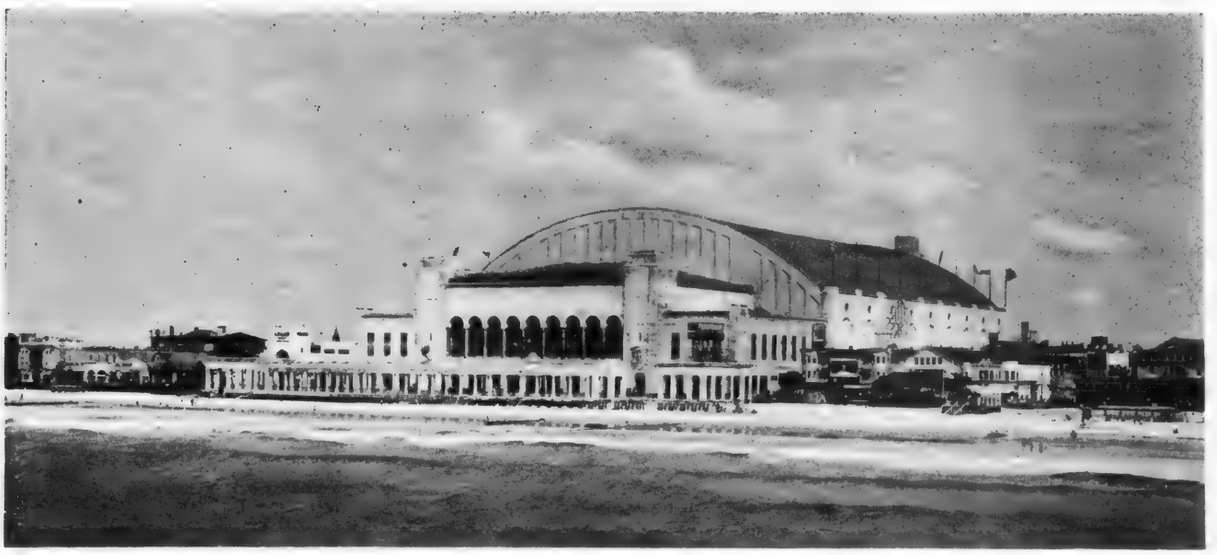
In using the electric arc, care must be taken to prevent the skin from being burned, as the arc is very rich in ultra violet rays. Hence, the necessity for a helmet or shield to protect the face as well as the eyes, and high gauntleted gloves of non-inflammable material to protect the hands, and no part of the skin should be exposed.

New Trade Association in New York

A preliminary meeting for the purpose of forming a trade organization covering the New York metropolitan area, including the adjacent portions of New Jersey and Connecticut, was held in New York, August 21. A charter was prepared and a number of those present signed as charter members.

The organization proposes to correct certain abuses in the heating trade such as misrepresentation; failure on the part of irresponsible concerns to bring their equipment up to acceptable standards of quality; to exchange credit information and maintain a uniform system of collection and to establish a board of arbitration.

The organization offers membership to reputable firms in the heating industry who sell, manufacture or vend heating specialties or accessories. Communications should be addressed to Leo A. Greenbaum, 70 West 40th Street, New York City, who is acting temporarily as executive secretary.



Municipal Auditorium, Atlantic City, N. J., Where the Eleventh Convention of the American Gas Association Will Be Held

House-Heating a Feature of Tentative A. G. A. Program

FROM all indications, there will be more exhibitors and a larger attendance at the eleventh annual convention of the American Gas Association at Atlantic City, N. J., October 14-18, than at any previous convention of this organization.

The growth of gas house-heating is reflected in the tentative program of the convention which includes numerous papers and reports of interest to heating men.

The commercial section will hold two sessions; one Tuesday, October 15, and one Wednesday, October 16. At the meeting on Tuesday afternoon, the symposium on house-heating will include "Sales Progress in House Heating," by H. B. Johns, of The Peoples Gas Light & Coke Co., Chicago. Paul V. Close, technical secretary of the American Society of Heating and Ventilating Engineers, also will read a paper "The Importance of Insulation in the Future Development of Gas House-Heating."

The tentative program also includes a symposium on "Results From Cooperative Merchandise Activities and Suggestions for Future Development," in which A. J. Peters, of the Consolidated Gas Company of New York, and John H. Hartog, Portland Gas Co., Portland, Ore., H. E. Dexter, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., will participate.

At a symposium on water heating, to be held Tuesday afternoon, papers will be read by Stanley Jenks, Northern Indiana Public Service Co., Hammond, Ind.; M. B. Buckley, Kansas City Gas Co., Kansas City, Mo.; H. E. Dexter, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.

At the meeting of the industrial gas section, A. A. Pihlman, of the Consolidated Gas Company of New York will present a paper on "Conversion Burners for Large Volume Water Heating."

One of the most interesting sessions at the convention will be the meeting devoted to house-heating. The first paper will be by A. A. Pihlman on "Conversion Burners." D. S. Reynolds, of the Boston Consolidated Gas Company, will report on "Large Building Heating." A paper on "Warm Air Heating—Unit Heaters" will be read by W. L. Thompson, of the Columbus Heating and Ventilating Company.

"Inspection and Service Manual" is the title of a report by J. D. Preble, of the Public Service Company of Northern Illinois, Chicago. Another will be a short report on fans by F. M. Rosenkrans, Gas Service Co., Kansas City, Mo. This paper will cover the use of fans in connection with warm-air furnaces.

A special pamphlet comprising a compilation of the house-heating forms used by 43 gas companies, together with prospect cards, gas consumption cards, etc., is being prepared for presentation at the convention by H. E. G. Watson, of the Consumers Gas Co., Toronto, Canada. In addition, there will be the usual statistical tabulation indicating the number of gas-fired central house-heating plants sold by approximately 250 companies during 1928-29.

At the manufacturers' section, Monday October 14, Edwin W. Ely, chief of the Division of Simplified Practice, Bureau of Standards, Washington, will read a paper on "Simplified Practice in the Gas Appliance Industry." At the evening session program, Wednesday, October 16, Hon. James J. Davis, Secretary of Labor, will be the feature speaker. His address, which will be broadcast by the National Broadcasting Company, will be a discussion of the "Essentials of Progress." All the sessions and exhibits will be held in the new Municipal Auditorium.

The committee on house-heating is composed of the following members:

H. B. Johns, chairman, The Peoples Gas Light & Coke Co., Chicago, Ill.
W. A. Burrell, Gannett, Seelye & Fleming, Inc., Harrisburg, Pa.
F. M. Chelf, Public Service Co. of Colorado, Denver, Colo.
W. B. Clemmitt, Consolidated Gas Electric Light & Power Co. of Baltimore, Baltimore, Md.
Leo Croner, Portland Gas and Coke Co., Portland, Ore.
H. H. Dugdale, American Gas Products Corp., New York, N. Y.
C. M. Grow, Southern California Gas Co., Los Angeles, Calif.
Thomson King, Peerless Heater Co., Boyertown, Pa.
N. A. Newton, Oklahoma Natural Gas Corp., Tulsa, Okla.

A. A. Pihlman, Consolidated Gas Co. of New York, New York, N. Y.
R. E. Polk, Equitable Gas Co., Pittsburgh, Pa.
J. D. Preble, Public Service Co. of Northern Illinois, Chicago, Ill.
D. S. Reynolds, Boston Consolidated Gas Co., Boston, Mass.
F. M. Rosenkrans, The Gas Service Co., Kansas City, Mo.
E. R. Rothert, Union Gas & Electric Co., Cincinnati, O.
H. H. Skinner, 1111 Old Orchard Ave., Dayton, O.
W. E. Stark, Bryant Heater & Mfg. Co., Cleveland, O.
H. A. Sutton, Public Service Electric & Gas Co., Newark, N. J.
W. L. Thompson, Columbus Heating & Ventilating Co., Columbus, O.
C. W. Waddington, The Brooklyn Union Gas Co., Brooklyn, N. Y.
H. E. G. Watson, Consumers Gas Co. of Toronto, Toronto, Ontario, Canada.

Manufacturers of heating equipment and related appliances, who will exhibit at the convention, include the following:

314, 316	Abendroth Bros., Port Chester, N. Y.
760, 762	Air Reduction Sales Co., New York.
452, 553	American Gas Products Corp., New York.
754, 758	American Radiator Co., New York.
417, 419	Armstrong Cork & Insulation Co., Lancaster, Pa.
337	Automatic Gas-Steam Radiator Co., Pittsburgh, Pa.
475, 477	B-Line Boiler Co., Cleveland, Ohio.
851, 853	Bristol Co., The, Waterbury, Conn.
340, 342	Bryan Steam Corp., Peru, Ind.
561-565	Bryant Heater & Mfg. Co., The, Cleveland, O.
168, 269, 271	Carrier-Lyle Corp., New York.
124	Celotex Company, Chicago, Ill.
344, 346	Cleveland Gas Burner & Appliance Co., Cleveland, O.
435, 437	Cleveland Heater Co., The, Cleveland, O.
319, 321	Clow & Sons, James B., Chicago, Ill.
140, 142	Collier Gas Heating Co., Lynn, Mass.
358, 360	Columbia Burner Co., The, Toledo, O.
150	Columbus Heating & Ventilating Co., The, Columbus, O.
824, 826, 925, 927	Crane Co., Chicago, Ill.
677, 679	Foxboro Co., Inc., The, Foxboro, Mass.
125, 127	Gas Heat Corp., New York.
251, 265	General Gas Light Co., Kalamazoo, Mich.
123	HEATING AND VENTILATING, New York.
332	Ironton Stove & Mfg. Co., Ironton, O.
650-654	Johns-Manville, Inc., New York.
145	Johnson Gas Appliance Co., Cedar Rapids, Ia.
833	Kieley & Mueller, Inc., New York.
445, 447	Kompak Co., The, New Brunswick, N. J.
633, 635	Linde Air Products Co., The, New York.
863	McDonnell & Miller, Chicago, Ill.
109, 111	Mettler & Co., Lee B., Los Angeles, Calif.
343-347	Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
611-615	Mueller Co., Decatur, Ill.
410, 412	Mueller Furnace Co., L. J., Milwaukee, Wis.
530-540	National Tube Co., Pittsburgh, Pa.
339, 341	Payne Furnace & Supply Co., Inc., Beverly Hills, Calif.
463, 465	Peerless Heater Co., Boyertown, Pa.
333, 335	Pennsylvania Furnace & Iron Co., Warren, Pa.
614-618	Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
141	Raymond Co., F. I., Chicago, Ill.
143	Richmond Radiator Co., Philadelphia, Pa.
130, 231	Roberts-Gordon Appliance Corp., Buffalo, N. Y.
454-458	Robertshaw Thermostat Co., Youngwood, Pa.
555	Spencer Thermostat Co., Cambridge, Mass.
774-776	Staynew Filter Corp., Rochester, N. Y.
236	Steinhorst & Sons, Inc., Emil, Utica, N. Y.
372-376	Surface Combustion Co., The, Toledo, O.
131-135	Sweet & Doyle Foundry & Machine Co., Troy, N. Y.
331	Thatcher Co., The, Newark, N. J.
469-473	Time-O-Stat Controls Co., Elkhart, Ind.
315	Titeflex Metal Hose Co., Newark, N. J.
158	Watts Regulater Co., Lawrence, Mass.

Gas House-Heating Being Aggressively Promoted

REPORTS from gas companies in the middle west indicate that aggressive campaigns are being carried on by several companies in an effort to obtain the heating load.

The Peoples Gas Light & Coke Co., of Chicago, has announced that home-owners can rent gas conversion burners from the company for $5 a month after paying a small installation charge. If the owner decides to purchase the burner at the end of the first year, the rental and installation cost will be deducted from the purchase price. This service is being advertised through 900,000 letters, 160 posters and 12 painted billboards, featuring the Roberts gas burner.

Probably the largest house-heating campaign ever attempted by any gas company is being carried on by the Kansas City Gas Company, under the supervision of T. J. Strickler, vice-president and general manager, and M. B. Buckley, business manager.

This company, which sold 1700 installations in 1926, 1600 in 1927, and 1200 in 1928, is endeavoring to obtain, during 1929, 5000 additional house-heating installations. The campaign is being carried on by newspaper, direct mail, and outdoor billboard advertising.

The first advertisements appearing in the schedule were on the new gas rate for house-heating. The many comforts and conveniences of gas heat were brought to prospects' attention, with an occasional mention of the special gas rate and the low price of equipment. The terms are 5% down and no further payment until October 1, then 24 equal monthly payments on the balance. Each month, beginning with June and continuing throughout October, every customer on the ledger, who does not live in an apartment or in a home now heated with gas, will receive a two-color, four-page letter. Approximately 45,000 of these will be mailed each month.

St. Joseph Turns to Natural Gas

More than 725 gas house-heating units were sold in St. Joseph, Mo., before the completion of the natural gas pipe-line running into that city. Of these, 535 were central heating plants. After starting work on these installations, an average of 60 units were installed daily, and within two weeks' time all had been completed.

The change from artificial to natural gas was made in the dead of winter on a zero day, but the job was completed without confusion or accident. The average daily distribution of manufactured gas had been about 1,200,000 cu. ft. Due to the higher B.T.U. content of natural gas, only about 600,000 cu. ft. were consumed daily after the natural gas was distributed. However, as soon as the house-heating installations had been completed, consumption jumped to 2,551,000 cu. ft. daily.

Large Tent in Utah Heated by Gas

Last winter gas was used to heat what is said to be the largest canvas tent ever erected in the State of Utah. The tent was 100 ft. wide, 420 ft. long, 34 ft. high at the peak, and 14 ft. high on the side walls, and housed the annual automobile show held in Salt Lake City.

Thirty gas heaters, such as are used for heating small homes, were installed and put into service two days before the show was scheduled to open.

While a snowfall and extremely cold weather complicated the problem of heating, the gas heaters maintained an average of 63° inside the tent, while the average outside temperature was 35°. The wind velocity ranged from 5.7 mi. to a maximum of 20 mi. per hr. The coldest outside temperature recorded was 12°. The total gas used during the week was 1,308,400 cu. ft.

This Is The Much-Discussed

Biddle Plan

Proposed for the Heating Industry

So much interest was shown in the credit plan for construction proposed at the recent annual convention of the Heating and Piping Contractors National Association in St. Louis, that we present herewith its salient features. The plan was presented to the convention by Nicholas J. Biddle, general manager of Allied Construction Industries, Inc.:

"Loose credit," said Mr. Biddle, "is directly responsible for overcrowding the contracting field, for price cutting, bid peddling, many other slippery and even crooked practices. The result is that the good operator is handicapped. The overcrowded field is a tremendous handicap. It sets up a competition which he cannot meet. It necessitates that this type of operator, who is a craftsman, who desires to do the very best type of work that he knows how to do, has to stoop to practices that are unworthy. He is penalized by having to pay the losses incurred by the jobber in the careless extension of credit. And, gentlemen, don't forget that for one minute. You men who pay your bills are paying the credit losses incurred by the jobber in the careless extension of credit.

"I wonder how long the contracting fraternity is going to stand for that condition? You can remedy it because the contractors of this country control the distribution of the money of construction and if that money is diverted to those people who set up and maintain clean-cut, ethical standards, you will find that the other fellow, the fellow that is inclined to cheat, will very speedily get in line.

"Now the trouble, and its cause being ascertained, the problem becomes one of method. We need the concerted attack of all units of this great industry, which is the second largest industry in this country, being eclipsed only by agriculture—we need a concerted attack on the part of all units, and that necessitates organization.

"As you know, the various groups of construction have some degree of organization, but in every case, gentlemen, there is considerable room for improvement. An organization such as I speak of, and I am only talking about local organization, must embrace all factors in the chain of distribution. The individuals are helpless and the individual groups are nearly so, to change these conditions in the industry.

"As I previously stated, the industry is so closely interrelated that the problems become industry problems and not those of any one group or section. I believe that the only cure, or at least the only thing that we can do to start the various industries off on a sound basis is for the various localities to organize their industries together, basing membership upon trade group affiliation. Because, gentlemen, if there is one thing that has stood between us and complete demoralization, it is these fine national trade associations with their active local chapters.

"However, we find at the present time in many localities that the efforts of one group or section of construction are to a great extent nullifying the efforts of another or other groups. We have got to unify that effort to make it effective, because working at cross purposes is always a waste.

"And another thing we must do, we must submerge the personal or factional jealousies and work for the good of a united construction industry.

Capacity, Price and Credit Govern Flow of Merchandise

"In the flow of merchandise from the manufacturer or producer to its fabrication in the ultimate construction project, there are several governing factors. The first being the capacity to produce, the second, price, and third, credit. It is impossible to control the productive capacity of this country. It is a free country and anybody desiring to go into any line of business may do so, provided he has the wherewithal to start. It is impossible to, and illegal to fix prices. I know that it has been done in sections, but it is purely a sectional proposition, and I am here to tell you gentlemen that it is an unsound practice, it invites competition, it penalizes the efficient contractor and subsidizes the inefficient contractor. It will not work for any great length of time because it is self-destroying.

"Credit, however, is a different proposition. It is legal to establish and maintain fair and equitable credit standards, and I have that on the authority of the United States Government because I took the trouble a year ago in May to call upon the Department of Justice and present this plan to them, and was assured by them that they had no objection.

"It is not only legal, but it is good business, because, why should we sell to anybody who is not paying for his goods or does not intend to pay?

"Sound credit policies rigidly enforced will decrease the burden on the industry, by decreasing frozen past due accounts, decreasing direct monetary loss, decreasing collection costs, and decreasing the numbers of operators in that field. It will result in an increased turnover, increased efficiency, increased sales aggressiveness, and increased profit.

"With a credit policy such as I am advocating it places the burden entirely upon the operator and does not allow him to lean on somebody else as has been the case in many instances in the past. Your operator to continue in the field must be qualified. He must make a profit on the work he does. He must collect his accounts because he has got to pay his bills if he is going to continue in business.

"Incompetent, under-financed operators cannot measure up to these standards and speedily fall by the wayside. This not only affects the contracting fraternity, gentlemen, but it affects also the wholesalers and even the manufacturers. But it affects the contractors first, and it takes some time before its influence is materially felt in the wholesaling fields.

"Continuously carried on, such a plan eventually will clean house in the construction industry and put us on a sound footing. It will eliminate many of the reasons for unethical, slippery practices which we now find in the field.

"This is not presented and never has been suggested as a cure-all for all the troubles of the industry, but merely as a sound foundation upon which the construction industry may build.

"It is easy enough for someone to stand up and tell you about these things, but, after all, the proof of the pudding is in the eating thereof, and, naturally, having had more experience in Detroit than anywhere else, I am going to have to tell you what has happened there. First in the electrical field, and later on throughout the construction industry.

"In Detroit," said Mr. Biddle, "in the electrical industry we have had many organizations in the past twelve or fifteen years. All of these organizations got about so far, unaided by anybody else, and then failed and the membership dwindled and finally we had a com-

plete disintegration of the unit. Eventually, however, we got an organization together and made very careful study of the problem and we came directly to the conclusion that loose credit was responsible for the condition in which we found ourselves.

"So we set out to change that condition. We set up a credit policy and this policy was that goods purchased during any month must be paid for by the tenth of the following month in order to secure a cash discount. They were net to the end of the month and if still unpaid all further shipments were absolutely C. O. D.

Jobbers at First Resisted Adoption of Plan

"We presented this plan to our jobbers and, to my great surprise, the jobbers could not see the thing at all. Here is a plan that I thought the jobbers would grab at but they didn't, and it was only after the most determined insistence on the part of the electrical contractors of Detroit that this plan finally went into effect, August 1, 1926.

"At that time there were 850 licensed electrical contractors operating in Detroit alone and not in the metropolitan area.

"In starting this plan, we realized that it would be unfair to shut down on the delinquent members immediately. In order to begin without disturbing the field too much, we allowed the contractors prior to August 1, 1926, to give notes for such of their indebtedness as they could not pay. From that time on the contractor was expected to live up to the terms of the policy, and in addition to that to pay off something on these notes at each maturity.

"Any time the contractor failed to make a fairly substantial payment on these notes, the whole amount became delinquent. We started this plan on August 1, with 850 contractors. On April 1, 1927, 750 contractors, March 27, 1928, 481 contractors, February 1, 1929, 366 contractors were left in the field. About 484 of these incompetent, unqualified operators had found it impossible to live up to the terms and conditions under which they had to work and had left the industry.

"The industry did not put these men out of business, gentlemen, and that is a point I want to make clear in your mind. The industry set up a standard and these men could not measure up to the standard and consequently eliminated themselves from the picture.

"The past due receivables of the electrical supply jobbers on August 15, 1927, in round figures, were $260,000. Those receivables tapered off month by month until on August 1, 1928, they were down to $38,000, and would have continued on going down until at the present time I doubt if there would have been more than $3000 or $4000 in past due receivables. However, on August 1, we took in the entire southern end of Michigan in the electrical field, and the next report showed some $60,000 in past due accounts.

"Our operation attracted the attention of the rest of the construction industry in Detroit and, after a number of preliminary meetings, we organized the Allied Construction Industry on October 26, 1928. On December 1, I took the field as the general manager of that organization. At that time we had seven groups. Today we have seventeen groups and the organization is working in wonderful shape.

"Here is a list of the groups in the organization:

"Robert Morris Associates Division, which includes the largest commercial bankers of Detroit, the Surety Association of Michigan, the General Builders Division, Lumber Dealers Division, Building Material Division, Electrical Contractors Division, Electrical Wholesalers, Lighting Fixture Dealers, Michigan Municipal Contractors, Detroit Fleet Owners, Sheet Metal and Roofing Supply Jobbers, Sheet Metal and Roofing Contractors, Steel Fabricators, Contracting Plasterers and Heating and Piping Contractors. We also have the Concrete Pipe Manufacturers, the Architects, the Reinforcing Steel Group, and the Painting Contractors. The prospects are that within the next sixty days we will have eight or ten additional groups.

"The Allied Construction Industries is an association of associations. Membership is only through a trade group affiliation, and we have stressed that point very strongly because we are not going to do anything to detract from the fine work that these trade groups are doing. Our operation is going to strengthen them and give them continuity of membership, give them an increasingly easy field in which to sell membership and our organization is going out directly in the field, not to sell membership in the Allied Construction Industries, but to sell membership in the Heating and Piping Contractors Association, the Building Material Exchange, the Association of Electragists, and so forth. Because in selling membership for those organizations we automatically will be bringing membership into our own.

"Each affiliated group elects representation with power to act in all matters pertaining to credit, and these representatives form our board of directors who are the governing body of the Allied Construction Industries.

"We found that the construction industry was such a comprehensive thing that we could not frame one set of by-laws that would cover all the various divisions of the industry. So, after much thought, we finally split the organization up into four major divisions.

"We have a financial division which consists of banks, bonding companies, trust companies, mortgage loan companies, and so forth; the producing and manufacturing division; the wholesaling division, and the contracting division. We follow the same practice in starting off a group on a credit policy in the Allied Construction Industries as we did in the electrical field, and that is to give the contractors in that field an opportunity to clear up the amount of money that they owe and cannot pay by a note, reducing the note somewhat at each maturity.

"We require every wholesale group that comes into our organization to set up a credit policy governing the terms under which they will sell to the trade, and that credit policy must contain a fixed credit limitation date beyond which the privilege of buying on open account will be withdrawn.

"We allow no deviations from that policy whatsoever by the individual, but we do find occasionally for some very good reason a contractor merits some relaxation of standard credit terms and for this purpose we have a committee consisting of the officers of our organization, the manager of the Detroit Association of Credit Men, and myself, who are the only ones having authority to relax the standard credit terms.

"In carrying on such an activity as this it was necessary to have some means by which the credit information could be collected, assembled, printed, and sent out. We were confronted with two propositions: one was to establish such an organization of our own and the other, which follows the policy of our organization, which is not to establish anything new when there is already something in the field which will do the work, was as follows: We picked out the Detroit Association of Credit Men and they are the agency which collects and disseminates the information.

Seller Watched Closely for Violation of Credit Terms

"Our organization you might call the police force because we watch to see that the suppliers or the sellers live up to the terms of the policy in the field and when they do not we proceed immediately to let the entire membership know that such a seller has violated the credit terms of his industry. When our contractors or purchasers are thoroughly sold on just what this loose credit practice means to them, you need have no fear about what will happen to the jobber who does not live up to the terms.

"We publish a credit bulletin. This bulletin was published on the fifth of May. It is only a very meager thing at the present time because it represents the exports of five groups in the industry, and only two of those fully reported. The others have not gotten under way yet, but at the same time we have $2,500,000 shown in the past due receivables in that bulletin with a total of 2,032 names.

"Every contractor who does not pay his account when it is due gets listed in this bulletin. His name, address, the number of firms involved, the division involved, and the amount of the indebtedness, and that goes to every member of our organization. So the contractor can no longer keep from his fellow contractor any secrets regarding his credit standing. He is either a good credit risk or he is listed in here, and isn't.

Credit Bulletin Stimulates Collections

"I have never found anything that stimulates collections to the extent this credit bulletin does. The contractors do not wait; the minute they get a job done they are on the trail of the owner to get their money any they are bolstered up by the fact that they have got to get that money if they are going to pay their bills. Consequently, these contractors do go out and get in the money. They are becoming much better business men and the strange part of it has been that in the electrical field with this tremendous reduction of the number of contractors we have not experienced any falling off in sales, but rather, during this slow period we have increased the sales of electrical goods in the Detroit market.

"I think you will find that will follow in any place because sales aggressiveness depends upon the prosperous condition of a company. A company that is just hanging on by the ragged edge is not in a financial position to put forth a very great amount of sales effort.

"The Allied Construction Industries organization is not old enough to have a lot of tabulated figures to give you. However, I can tell you that, due to our efforts in the field, a general contractor who perhaps did two or three million dollars worth of business a year annually, found that he could go no further and came into the association of credit men and our office for a voluntary liquidation of his affairs.

"Another contractor who last year did ten million dollars worth of business got in a position where he could not keep up with the parade, and instead of allowing that man to continue as he would have under the past set-up, he was immediately called in by our organization and right now is operating under the supervision of a credit committee who will either wind up the work that he has on hand at present and close him out, or find that he is sufficiently well financed to be able to continue after some of the delinquent accounts which he has on his books are collected.

"That work is going on continuously in every branch of the field, and gentlemen, I am here to assure you that the Allied Construction Industries of Detroit is getting public recognition.

"It is getting recognition on the part of the architects who are not members. We have continuous calls from the architects to find out the credit standing of contractors before they let the work and there is just one thing more I want to point out, and that is with a unit organization (a single industry organized) you haven't the cross ties that can make this proposition as effective as you can through an allied construction industry organization.

"Just suppose for an instance that some heating and piping contractor of Detroit was buying from a supply jobber who could not play the game, and he was notified and said, 'Well, I am going to continue to buy from that firm.' The general contractor is just as much interested in where these materials come from as is the heating and piping contractor, and before the man goes far with the job the general contractor probably will notice where this material is coming from and use his influence to see that those orders are placed with a jobber who is playing the game.

"In addition to that we have the surety companies, and the banks, and they are wholeheartedly in this proposition. It is fundamentally sound. It is a plan that I can recommend to you and that you can recommend to your organizations back home, and if you put it into effect, gentlemen, you are going to clear up the channels of distribution and get rid of the dead wood of construction."

IN the ensuing discussion, one of the members asked, "Suppose our association should decide next week that we should want to go ahead with this plan. Could we obtain all the forms and details of the method of procedure of setting up the necessary machinery." Another member asked how the plan was financed.

In response, Mr. Biddle said that an organization such as he had described could be set up anywhere and it does not have to be organized primarily as an allied construction industry movement.

"If you cannot get the rest of the industries to cooperate with you," he added, "you can set it up in your own industry and achieve a considerable degree of success. You will speedily have the representatives of the other industries wanting to cooperate and extend it to an industry-wide group.

"In regard to financing, membership in our group is only through a trade group affiliation and the cost is $5 per month for each individual coming in. This money is collected by the trade association or, at least, paid out of its finances. We don't care how they collect it so long as they turn into the treasury of our organization $5 a month for each of their members.

Manufacturers and Jobbers Required to Join Credit Organization

"With the supply houses and manufacturers and the financial division members, we also require that they join the Association of Credit Men, which costs them $35 a year. With the manufacturing and wholesale division, we require in addition that they pay for the compilation of this credit bulletin and the cost of collecting the information, which at the present time is $10 a month.

"On or before the first of each month, it is compulsory for every wholesaler who is a member of our organization to send in a complete list of all the accounts delinquent, under the terms of the credit policy in his field, to the Association of Credit Men for compilation in this bulletin. This is not a voluntary proposition on his part but is an absolute necessity. We have the privilege in our by-laws of sending out an auditor at any time to check the receivables of any member, who we feel is not being properly reported.

"There is one thing I forgot to tell you with regard to our credit policy governing the payment of general contractors to sub-contractors. We have established the policy whereby all payments are due the contractor within five days after the general contractor receives his money from the owner or architect. If unpaid by the end of that current month, the general contractor can be listed in the credit book.

"We understand just as well as you do that the general contractor should have money enough to carry on his business and that you should not have to wait, regardless of whether the general contractor receives his money or not. But we have to creep before we can walk and we wanted something that would be effective right now, so we established that policy, which cleans up about 95% of our troubles between the sub-contractors and the general contractors."

The Future of the Heating Industry

PRACTICAL suggestions for helping the heating contractor to meet the new business conditions facing the industry were contained in the address of Russell B. Creviston, before the recent convention of the Heating and Piping Contractors National Association.

"There are three classes of products," said Mr. Creviston, as reported in the association's *Official Bulletin*, "according to the buying habits of the people. One is known as shopping goods. A product that falls under the classification of shopping goods is a product, as the name implies, that a buyer shops for in his desire to compare quality, style and price.

"Our product is a shopping product. There are two important characteristics which follow all shopping products. One is, that no matter what kind of a market you may be in, whether it is a buyer's market or a seller's market, any shopping goods have to be aggressively sold; more so than the other two major classes of goods, which are convenience goods, such as groceries and tobaccos, and impulse goods, such as novelties, fruits, or sweet things that you see sold in railroad stations and that are bought primarily upon the impulse of having seen them.

"Let me emphasize that once more. The products which you gentlemen are selling fall into the classification of shopping goods. You are always up against the buyer's inquisitiveness as to the price, the quality, and the style of your product, regardless of the condition whether you are fortunate enough to have a seller's market, or unfortunate enough to have a buyer's market, as you have today. Therefore, your product will always require an aggressive sales effort.

"One very important factor which enters into aggressive sales effort is cooperation with the members of your branch in particular and the members of the industry as a whole.

"It is very natural for you to be more interested in the mechanical side of your business than the business side, but in order to do aggressive selling you must study the management and selling problems of your business.

"It is also an age-old instinct of craftsmanship to be jealous of the man with whom you are in competition. You must live down that age old instinct of jealousy if you are to occupy a dominant position in the future.

"Another factor that controls your future is that we are no longer a pioneer people in this country. Up until about 1922 you men have had a market handed to you. As craftsmen with a market created for you as a result of the growth of our country, you could give most of your time to the engineering side of your business. That point is passed. We are no longer building new cities and settling new sections. Your new market is the 1000 a day needed by our increase each year, the complementary construction necessary to take care of the needs of this increase along the lines of office buildings, educational buildings, etc., and the construction necessary to house new industries and the buildings which time renders unsafe or uneconomical, only a small part of the amount of business which you have to have in order to be prosperous. Therefore, your future, from the standpoint of market, depends upon your creating business to replace that which has come to you in the past as a natural growth of our people.

"You commonly fall into two classes: the large contractor and the medium contractor who also handles repair work. You are affected, both of you, irrespective of the size of the business which you attempt to do, by the conditions which have been developed during the past two decades by science and invention. There isn't a large contractor in the hearing of my voice that is not today confronted with the promotion problem of his business, and it is entirely different from what it was ten years ago.

"Irrespective of whether you are a contractor exclusively on large work, or whether you are a small contractor doing a certain amount of repair and jobbing work, you are forced to the analysis of the promotion of your individual business. Don't let the man who has arrived, who has built his business under different conditions, control your viewpoint, especially those of you who will have to build your business under conditions of today.

"I have heard, during my short service to these industries, men who had arrived in the contracting division say that the idea of your having to promote your business differently than you did ten or twenty years ago was a lot of bunk. That man, gentlemen, is drifting with the current. He has arrived, and, if you let his ideas of business control your judgment, either individually or in your local association or in your national association, if you haven't arrived you never will.

"Look into your future trends, make a study and see whether you are in such an assured position from the standpoint of heating through the present method as you might think.

"Do what the great electrical industry has done. Form a national council of all groups in this industry for the purpose of being an advisory council to the industry in handling of those common problems, which now are being solved. Such a service does not exist at present. The mechanism exists in the Plumbing and Heating Industries Bureau and can be expanded, but in its present conception and functioning, it does not fill that requirement.

"When you have built such a structure, add to it vision, have faith in one another and sufficient courage to put across your convictions and, in my humble judgment, the future will be secure."

Other Industries Expand Their Trade Association Work

WHILE the Plumbing and Heating Industries Bureau has been forced to curtail its program of industry selling and consumer education because of the lack of funds, other industries are actively expanding such trade association work. A pertinent editorial in the Plumbing and Heating Industries *Bulletin* for August makes a strong plea for continued cooperation among the trade associations of the heating and plumbing industries. The editorial follows:

> Just at the time that the Plumbing and Heating Industries Bureau announces its inability to continue the enlarged program of industry selling and consumer education begun in 1927, announcement is made of expansion in the trade association work of other industries.

The American Institute of Laundering has recently laid the cornerstone of its new $500,000 building. Eighty-seven applications from students who wish to take a course of training at the institute are now on file at the association headquarters.

The National Association Institute of Dyers and Cleaners has erected a building at a cost of $320,000.

The Rug Cleaners' Institute of America also announces progress in its work of dealer education and sales promotion.

When the laundrymen of the country can see financial benefit by investing $500,000 in a building in which they will carry on their campaign to educate people to send their laundry out, it seems that the plumbing and heating industries are hardly in step

with the times when they confess their inability to work together in the financing of their program for the education of the public to modernize its plumbing and heating and to have a proper appreciation of the essential services of the two industries.

A recent bulletin of the Chamber of Commerce of the United States from which the above information regarding the laundrymen, the rug cleaners and dyers was taken, is full of news of expansion in the activities of trade associations. There is page after page about the Silk Association of America, the Institute of American Meat Packers, the National Lumber Manufacturers' Association, the Paperboard Industries Association, etc.

No thoughtful person connected with the plumbing and heating industries can read this bulletin of the Chamber of Commerce without wondering where the plumbing and heating industries will be ten years and even five years from now if the Bureau is allowed to go into the discard while other industries multiply and expand their mass selling programs.

The Bureau's financial condition is critical. National advertising has been suspended, the field force has been reduced from fourteen to four men, the women's department has been abandoned, and there have been many reductions in the headquarters personnel.

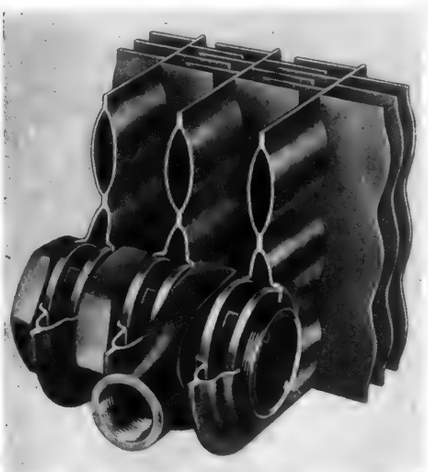
By effecting these curtailments on July 1, the board of directors was able to balance expenditures with income. However, should the resignations of members in the wholesaler and smaller specialty manufacturer group continue during the last six months at the rate prevailing during the first six months, it is doubtful if the Bureau will be able to function beyond the end of the year.

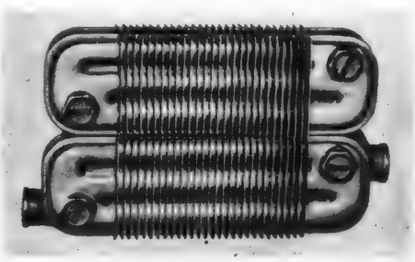
The board of directors will meet again late in September. Before that time, those men and those groups in the plumbing and heating industries who believe in these industries, who believe that they have a future, and who believe that all groups working together can get further than individuals and individual groups working separately, should so express themselves in letters to the Bureau.

And this should be done now.

Construction of Light-Weight Heating Surface

CONSIDERABLE interest has been shown in the illustrations of the various types of light-weight heating surface which appeared in HEATING AND VENTILATING for June and July. The types shown below are some of those which have not been shown in previous issues, and include those used in unit heaters, concealed and cabinet radiators.

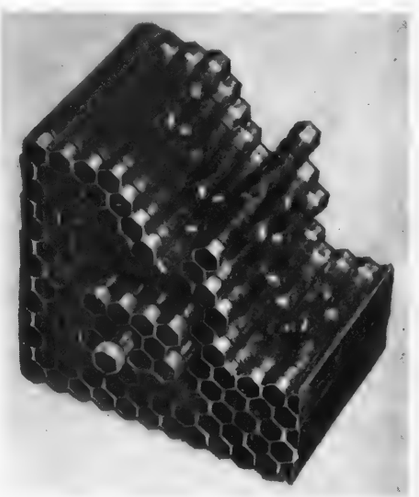


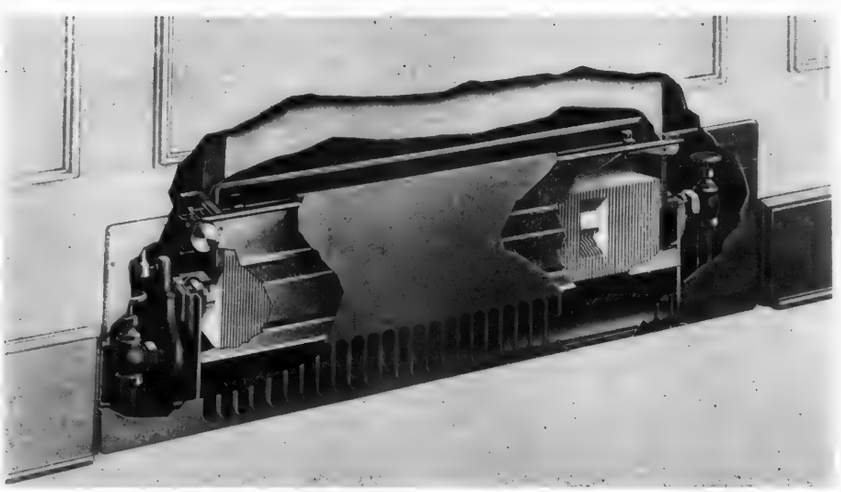


Rome Brass Radiator

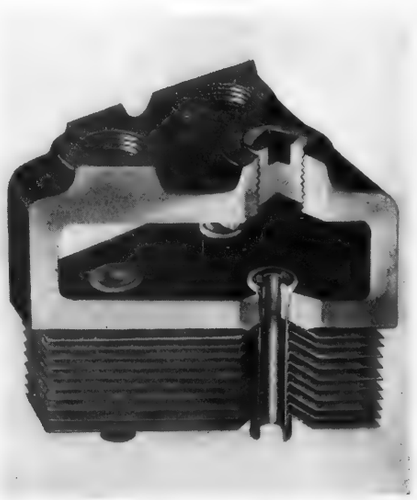
(left) Construction Details of Rome Brass Radiator

(right) Copper Radiator Made by Winchester Repeating Arms Co.





Concealed Heating Surface Manufactured by Circulair, Inc.



Detail of Surface Used in Trane Unit Heater

Correspondence

Can Landlord Claim Tenant's Oil Burner?

EDITOR HEATING AND VENTILATING:

I have a tenant in one of my houses, who has occupied the premises for four of five years, his lease automatically renewing itself. Some time ago, without permission from me, he installed an oil burner in the house. At this time the tenant owes me about $3500 and shortly I shall have to dispossess him. Before doing so I want to be certain as to whether he may remove the oil burner as his property or whether he will have to allow it to remain in the house, inasmuch as he had the old heating plant replaced. If the tenant is dispossessed, can the landlord claim the oil burner?

M. E. F.

New York, N. Y.

The question of the removability of an oil burner installed by the tenant does not seem to have arisen in the courts. It would probably come under the rule that: "The right to remove ornamental and domestic pictures is subject to the limitation which prevails as regards trade pictures, that the removal is not permissible if it will cause substantial damage to the freehold and that an article or structure was substituted by the tenant for one there at the time of the lease may also be a reason for denying the right to remove it." 26 C.J. 704.

In Pond v. O'Connor (1897) 70 Minn. 266, a heating plant consisting of a boiler set in a cement and brick foundation and attached to radiators, which was substituted by the lessee for a prior one which belonged to the lessors, was held to have become a part of the realty.

In Northwestern Lumber and Coal Co. v. Parker (1914) 125 Minn. 107, where it was held that a heating and power plant was so connected as to make it part of the premises, the court said: "It is not necessary to determine the precise limitation upon the (tenant's) right of removal. Certain it is that in no case can the tenant remove fixtures, no matter what the purpose for which they were installed, if they are permanent in their nature and if their removal will leave the freehold in a substantially worse plight than before the annexation was made." (Ewell, Fixtures, 92, etc.).

The question whether a chattel which has been attached to the realty becomes a fixture is always largely one of fact, and the test is usually its removal without damage to the premises.

JOHN SIMPSON

Buckwheat as a Domestic Fuel

EDITOR HEATING AND VENTILATING:

In a summary of a paper read by George Orrok, before the American Society of Mechanical Engineers, at the Knoxville meeting, and included in the article "A Brand New Domestic Fuel" in the May issue, a tabulation is reproduced giving the comparative cost of bituminous coal, high temperature coke, low temperature coke, etc., with anthracite.

Mr. Orrok has taken as the price of anthracite $14 per short ton. Of course, the greater portion of domestic anthracite sells to the customer at about this amount. However, the use of anthracite buckwheat is becoming a factor in domestic heating and any consideration of this subject should include a comparative price of buckwheat as a domestic fuel.

At $9 a ton, 12,300 B.T.U. per lb., 65% efficiency, the cost per million B.T.U., using buckwheat will be 56 cents, a very low figure as compared with the other fuels cited.

Buckwheat, burned in an automatic domestic stoker, now in very considerable use throughout the anthracite burning territory, has many advantages. It has all the cleanliness and safety features of the larger sizes of anthracite; it avoids the abrasive and bulky characteristics of coke, and is non-explosive and non-poisonous. It is an attractive fuel from the standpoint of both the dealer and the customer.

NOEL CUNNINGHAM

New York, N. Y.

High- or Low-Pressure Steam for Heating Factory Building?

EDITOR HEATING AND VENTILATING:

The question has been referred to us as to the most feasible manner of heating a large factory building. The final load on the building will be approximately 1000 H.P., the building to be heated by low-pressure unit heaters.

The present question in mind is the type of boiler and whether high- or low-pressure mains are more practicable and more economical; whether the portable fire-tube boiler or the brick-set water-tube boiler is more suitable.

We would appreciate it if you could refer us to any articles on this subject or any other information you may be able to furnish.

M. N. B.

New York, N. Y.

From the information furnished by our correspondent, it is impossible to make any definite recommendation. It would depend on whether the steam is generated at high pressure and must be distributed to low-pressure unit heaters, or whether the choicee is between high- or low-pressure steam.

Assuming, however, that the steam will be generated at high pressure and further assuming that this pressure is approximately 100 lbs., and that the distance from the boilers to the furthermost unit is 1000 ft. or more, it would appear that high-pressure distributing lines would be best suited. If it is possible to use the steam in turbines or engines and heat with the exhaust steam from this power equipment, material savings could be effected.

Where it is necessary to reduce the pressure by means of pressure-reducing valves, there is a certain amount of superheat in the low-pressure lines. This superheat materially reduces the capacity of any heating equipment, since superheated steam is a dry gas. If steam at high pressure must be used for the heating units, it would be far better to install high-pressure unit heaters, thereby saving not only on the first cost and upkeep on pressure-reducing valves, but also on the equipment itself.

Floor Heating Installation Made Nineteen Years Ago

EDITOR HEATING AND VENTILATING:

Years ago when we were making plans for our new home, I told the architect we would use a hot water system for heating. The next time we met he demurred, saying the radiators would be altogether too bulky. After looking at room after room on the plans, we quickly agreed on long low radiators, either under window seats or built in under the windows. Then, pointing to a built-in verandah with a tile floor, he asked: "Where will you place the radiators in this room?" I could find no place where even a small steam radiator would not be seriously objectionable. For a few seconds he had me floored. Then memories of the old Roman baths at Trier furnished the answer: "That will be the best heated room in the house. We will place the pipes in the concrete directly under the tiles."

The work was carefully installed, using cross re-inforcement.

Although the same heat loss and pipe-sizing formulae were used throughout, this room was unlivably hot. Each alternate pipe was cut and capped. Still it was too hot. Then the supply was changed and taken from the return from a small bathroom. After putting in and almost closing a small throttle valve, the temperature was normal.

After a full year's use the architect and contractor on their hands and knees carefully inspected every inch of the tile floor, determined to find cracks. After nineteen years' use it is still free from all cracks and has given perfect satisfaction in every way. Children always appreciate this floor and naturally gravitate to that room for playing on the floor.

The front vestibule proved wholly satisfactory. Three of the bathrooms were treated in the same manner, only in these rooms the heat was divided between wall radiators for hot towels, and the floor pipes. The floor pipes should have had their supply taken from the return of the wall radiator.

The garage also was heated by floor pipes, and the chauffeur never wants to work on a cold concrete floor again.

V. E. EDWARDS.

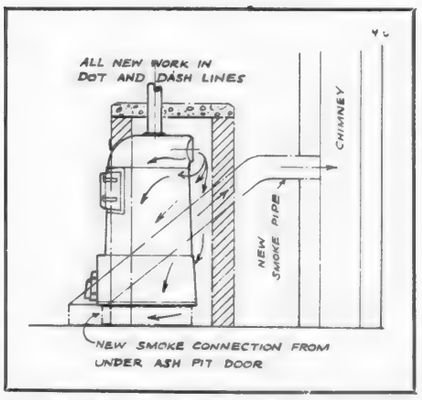
Worcester, Mass.

Increasing the Capacity of a Domestic Heating Boiler

EDITOR HEATING AND VENTILATING:

The following means of increasing the heating surface of a small water heating boiler may be of interest. A dwelling with 425 sq. ft. of water radiation was enlarged, the addition requiring 325 sq. ft. of additional radiation. As the original boiler was rated at only 600 sq. ft., it was necessary to increase this rating in order to take care of the new load. Rather than pay for a new boiler of larger size, the owner hit upon the following ingenious scheme for increasing his water heating surface:

He raised the boiler on a concrete foundation 9 in. above the cellar floor, then completely encased it with a 4-in. air space and 4 in. of common red brick, building a concrete roof on a tin form over the top of the boiler. He then covered the top and brickwork with 85% magnesia plastic, leaving a smoke outlet in front, under the ashpit door. The gases now pass through the original smoke outlet at the back into the 4-in. air space, and around and out through the new smoke outlet at the front. The heating surface of the boiler is increased perhaps 40%, at a small expense, and the hot-water system is



Boiler Heating Surface Increased by Circuitous Flue Connection

taking care of the load in a very satisfactory manner.

The objection to this arrangement is the circuitous flue connection required from the bottom front of the boiler around to the rear chimney connection. However, no trouble has been encountered from this source, although it is a natural-draft, oil-burning installation.

G. K. BRINGHURST.

Philadelphia, Pa.

Overheating of Expansion Tank

EDITOR HEATING AND VENTILATING:

Quite recently a hot water heating plant was installed from plans made by ourselves, in a hospital near here. Shortly after the plant was put in operation, a fire occurred in the new wing of the building, which was not quite finished and not occupied. There was some question as to what caused the fire and the following is what the chairman of the hospital board has written us regarding same:

"The Fire Marshall, Mr. ——, visited our hospital today and he says the fire was caused by an overheated expansion tank and suggests that same be kept at least 4 in. away from the wood and covered with asbestos."

What do you think of that? I have an idea of my own and am not convinced yet that I am not right.

We would thank you to give us your opinion as to the possibility of an expansion tank causing a fire in any building. We would also be pleased to have your readers pass their opinion and let us know if they ever heard tell of such a thing.

J. P. C.

St. John, N. B.

If the temperature of combustible material is raised to that of its ignition point, it will burn. Ordinarily, the ignition temperature of wood is 1000°, but under close and confined conditions of long duration the wood chars and its ignition point becomes very much lowered.

Under favorable conditions fires have been caused by heating pipes, but it is usually difficult to convince the layman of this because there is no observer present, but it is not so difficult to prove the case and to start a fire from this cause in the laboratory, as has been done at various times.

The National Board of Fire Underwriters has a rule to the effect that no steam or hot-water pipe shall be within 1 in. of any woodwork; furthermore, the pipe covering must be of incombustible material. Fire insurance interests and authors experienced along such lines are of one mind in this respect and many building codes also recognize the hazard.

Water heating systems, particularly those of the closed type, reach the temperature of steam heating systems. Warm-air furnace pipes should be kept 6 in. away from woodwork.

T. W. REYNOLDS.

Specific Speed and Fan Selection

EDITOR HEATING AND VENTILATING:

"Specific Speed" is a term not to be confused with the R.P.M. of any centrifugal machine, such as a water turbine, centrifugal pump, or centrifugal fan. It is a mathematical term that ties in the R.P.M., quantity and pressure.

In submitting the information on Fan Limitations published in THE HEATING AND VENTILATING MAGAZINE for May, 1929, I wished to call to the attention of fan users and fan manufacturers, first that the theory of specific speed, well recognized by water turbine engineers and largely recognized by centrifugal pump engineers, has a place in the fan industry. I particularly wanted to show that the available range of specific speed for high efficiency covered by the better class fans on the market is relatively small.

I also wanted to show that in the majority of cases fans for direct connection to constant speed motors, when of standard design, waste power.

My paper was presented solely for the purpose of showing fan limitations of today with the hope that a demand for high grade fans might be produced and that there might be a response on the part of the larger manufacturers. Nothing in my article clashes in any way with the general laws of fan performance in current use.

I would be very glad indeed to amplify this discussion, if desired.

CHARLES A. CARPENTER

Pittsburgh, Pa.

Officers of Pierce, Butler & Pierce at the Syracuse Plant in 1885

Glancing Backward

XV—Pierce, Butler & Pierce Mfg. Corporation

ON September 19, 1814, Sylvester P. Pierce, fountain head of all Pierce, Butler & Pierce history, was born in the village of Sanquoit, Oneida County, New York, fifth child in a family of eight. His father, Dr. Spaulding Pierce, owned a farm on which, as soon as he was old enough, Sylvester worked summers, going to school in the winters until the age of twelve, when his father died.

In school Sylvester learned the essential facts of discipline, application and truth under the stern tutelage of a Puritan pedagogue. On the farm, a pioneer father taught him the value of work, courage and thrift. So Sylvester left home well prepared for his first job as a youthful clerk and salesman in Utica, New York.

Thirteen years he stayed at his first task until, in 1839, appreciating the greater opportunities in the larger town of Syracuse, he located there and with his hard earned savings engaged in the crockery business. Soon he was importing earthenware from England, France and Germany for the good Syracuse housewives of the middle of the nineteenth century.

But the crockery business did not long hold Sylvester's ambition. A new industry—heating and plumbing—offered greater opportunities. Mr. Pierce, with typical Yankee acumen, saw the possibilities in this new field and entered into a partnership with John Chase, under the firm name of Pierce & Chase, for the purpose of conducting a plumbing and heating contracting business. Thus the name Pierce early became associated with the heating industry—and the business prospered.

In the meantime, Mr. Pierce had married and in due course of time his family was increased by the addition of one daughter and three sons. Two of the sons were eventually taken into the crockery business under the name of S. P. Pierce & Sons. Mr. Chase was bought out of the new heating and plumbing contracting business and the third son, William K. Pierce, and a son-in-law, William A. Butler, were taken into the business under the name of Pierce, Butler & Pierce—wholesale gas, water and steam supplies and sanitary engineering.

Company Successful in Contracting Business

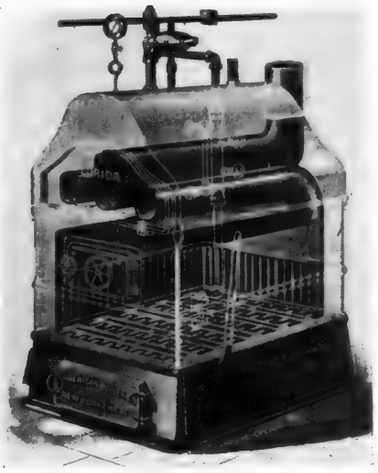
Within ten years the company became the largest contracting concern in central New York, employing as many as 150 steamfitters and plumbers at one time in different parts of the state.

In 1886, Mr. Butler retired and the company was reorganized under the name of Pierce, Butler & Pierce Manufacturing Company with a capital stock of $200,000. Two years later, in 1888, with characteristic foresight, S. P. Pierce, then 74 years of age, became convinced of the future possibilities in home heating and sanctioned the purchase of a large foundry and machine shop at Geneva, N. Y. The Catchpole Manufacturing Company then was organized with a capital stock of $100,000 for the manufacture and sale of a home heating boiler designed by A. A. Catchpole.

This, the first boiler manufactured by the Pierce organization, was known as the "Florida" in the steam boiler, and as the "Tropic" when equipped as a water boiler. It was made of cast-iron base rings and dome with a magazine in the center through which the coal was fed.

In the meantime, S. P. Pierce, the father, had retired from the business and William K. Pierce assumed active control. Through careful management, both companies were unusually successful. The combined annual business increased from $50,000 in 1876, to over $1,000,000 in 1890, when, in order to simplify the management of the companies and economize in their operation, the son brought about their consolidation under the name of the Pierce, Butler & Pierce Manufacturing Company, with a capital stock of $600,000.

In 1893, the American Boiler Company was formed by five of the larger boiler manufacturers, with headquarters in Chicago. The capital stock was $1,000,000. Four years later, in 1896, Pierce, Butler & Pierce bought out the other stockholders and united all inter-



"Florida" Steam Boiler

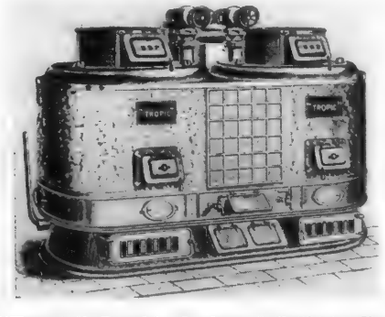
ests under the name of Pierce, Butler & Pierce Manufacturing Company.

In 1914, the company operated a factory at Eastwood, a suburb of Syracuse, N. Y., with distributing branches in New York City, Boston and Philadelphia, and sales offices in Baltimore and Washington. In that year William K. Pierce retired from the company, and Dr. J. T. Duryea was elected to the presidency.

Main Offices Moved from Syracuse to New York

Under the direction of Doctor Duryea the organization expanded rapidly, absorbing in succession a number of prominent mill-supply and jobbing houses in principal commercial centers of the Atlantic coast and Mid-Western states. Additional factory branches also were opened so that in a short time distribution outlets were in operation throughout these territories. In 1915, the company's main office was removed from Syracuse to New York City where headquarters were established on 162nd St.

These developments in the sales and distributing organization were paralleled by the growth of the manufacturing facilities. In March, 1917, the Syracuse Faucet & Valve Company and the Azadian Gauge Company, both of Syracuse, were bought and united as the Valve and Gauge Division of Pierce, Butler & Pierce.

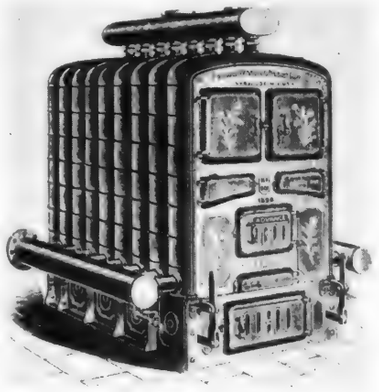


"Tropic" Double-Jacketed Self-Feeding Water Heater

In June, 1919, the Ames Iron Works of Oswego, N. Y., was absorbed. As an independently operating unit, the Ames Iron Works Division's principal products are Ames horizontal and multi-cylinder vertical uni-flow engines and high- and low-pressure steel boilers.

Pierce, Butler & Pierce in July, 1920, acquired the properties of the Atlantic Radiator Company at Huntingdon, Pa., and in March, 1923, the Federal Radiator Company at Zanesville, O., was purchased.

Doctor Duryea died in January, 1927, and his son-in-law, Roger Morton, was elected president. Mr. Morton had been with the company for several years in various capacities and, since 1925, had been on the board of directors and treasurer. His experience covered practically all departments of the business, including both manufacturing and selling. He was, therefore, well equipped to step into the position left vacant by the death of his father-in-law.



"Advance" Water Heater

In April of this year, Stanley B. De Long, formerly general manager of manufacturing, was induced to accept the responsibilities of the presidency.

The new Pierce-Eastwood jacketed boiler was announced early this year, and Pierce-Eastwood screw nipple radiators are among the latest products of this company. Further additions to the boiler lines are in course of preparation now and will be announced in a short time.

"Guide" Will Contain New Chapters

The forthcoming 1930 edition of the A.S.H.V.E. *Guide*, which will be off the press in November, will contain three new chapters—Heating by Electricity, Specifications, and Symbols.

Advance information from the society states that the new edition will contain more engineering data, will be more completely indexed and have a larger catalog section than previously.

A complete list of the chapters in the 1930 *Guide* follows:

1. Codes and Standards.
2. Heat Losses from Buildings.
3. Standards of Ventilation.
4. Ventilating Systems.
5. Heating with Warm-Air Furnaces by Gravity.
6. Heating with Warm-Air Furnaces by Fan Pressure.
7. Air Conditioning and Cooling.
8. Air Cleaners.
9. Unit Heaters and Air Conditioners.
10. Heating by Coal.
11. Heating by Gas.
12. Heating by Oil.
13. Heating by Electricity.
14. Chimneys.
15. Boilers.
16. Conductors and Convectors for Steam and Hot Water Heating.
17. Automatic Heat Control.
18. Pipe and Fittings.
19. Pumps and Traps.
20. Piping for Steam Heating Systems.
21. Piping for Hot Water Heating Systems.
22. Piping and Equipment for Laundries, Kitchen and Hospital Service.
23. Water Supply Piping for Buildings.
24. Heat Insulation for Pipes and Surfaces.
25. District Heating.
26. Selection of Fans and Motive Power.
27. Air Ducts.
28. Pneumatic Exhaust Systems.
29. Drying by Evaporation.
30. Ozone and Ventilation.
31. Notes on Requirements for Special Types of Buildings and Service.
32. Specifications.
33. Physical Properties, Weights, Measures, etc.
34. Symbols.

H. & P. C. Albany Association Formed

Heating and Piping Contractors Albany Association has recently been organized in Albany, N. Y. John H. Doerr has been made manager and Raymond Niles is secretary, with offices at 394 Central Avenue. The organization's membership has adopted the plan of certified heating created by the Heating and Piping Contractors National Association.

Marsh Appointed Manager of Milwaukee Association

Carl J. Marsh of Madison, Wisc., has been appointed by the Heating and Piping Contractors Milwaukee Association as manager of the local office to succeed Oscar A. King, who has resigned to become associated with the Wisconsin State Chamber of Commerce. In his new capacity, Mr. Marsh plans to continue the program of expansion inaugurated by the Milwaukee association some time ago. The association is now on a firm foundation with its certified heating program and is noticing a constantly increasing demand for the service. Mr. Marsh is an attorney and has specialized in association problems for several years.

(Concluded from Data Sheet No. 14-A)

STANDARDS OF

HEATING AND PIPING CONTRACTORS NATIONAL ASSOCIATION

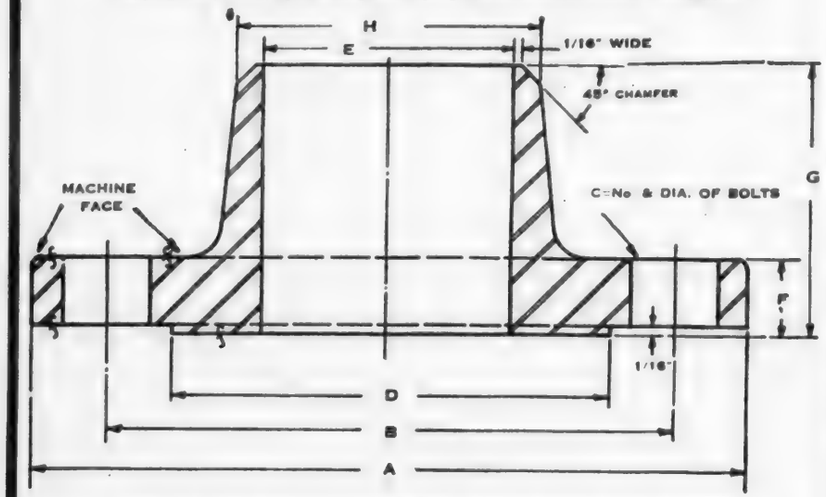
COMMITTEE ON STANDARDIZATION

SUB-COMMITTEE ON WELDING

EXTRA HEAVY WELDING NECK FLANGES FOR STANDARD PIPE

Series 30

Copyrighted, 1929, by Heating and Piping Contractors National Association



Size	A	Drilling		D	E*	F	G	H
		B	C		Standard Pipe			
2	6½	5	8– ⅝	3⅜	2⅛	⅞	2¾	2½
2½	7½	5⅞	8– ¾	4⅛	2 15/32	1	3⅛	3
3	8¼	6⅝	8– ¾	5	3 1/16	1⅛	3⅛	3⅝
4	10	7⅞	8– ¾	6⅜	4 1/32	1¼	3⅜	4⅝
5	11	9¼	8– ¾	7⅝	5 1/16	1⅜	3⅞	5 11/16
6	12½	10⅝	12– ¾	8½	6 1/16	1⅜	3⅞	6¾
8	15	13	12– ⅞	10⅝	8	1⅝	4⅝	8¾
10	17½	15¼	16–1	12¾	10	1⅞	4⅝	10⅞
12	20½	17¾	16–1⅛	15	12	2	5⅛	12⅞
14 O.D.	23	20¼	20–1⅛	16¼	*	2⅛	5¾	14 5/16
16 O.D.	25½	22½	20–1¼	18½	*	2¼	5¾	16¼
18 O.D.	28	24¾	24–1¼	21	*	2⅜	6¼	18¼

* Orders or inquiries should specify diameter of bore "E" required.

SUPPLEMENT TO OIL FUEL SPECIFICATIONS

Under date of February 4, 1929, the Bureau of Standards sent out a tentative Commercial Standard on Domestic and Industrial Fuel Oils.

Effective July 18, 1929, these standards were accepted by the industry and announced as the Commercial Standards of the Bureau of Standards, Department of Commerce.

As accepted, the standards involved a few slight changes from the Oil Fuel Specifications, as published in Data Sheets 48-H, 48-I, 48-J, 48-K, 48-L, 48-M, and 48-N.

Changes were made in the nomenclature for the various classes of oils as follows:

No. 1—Light Domestic Fuel Oil. A light distillate oil for use in burners requiring a high grade fuel.

No. 2—Medium Domestic Fuel Oil. A medium distillate oil for use in burners requiring a high grade fuel.

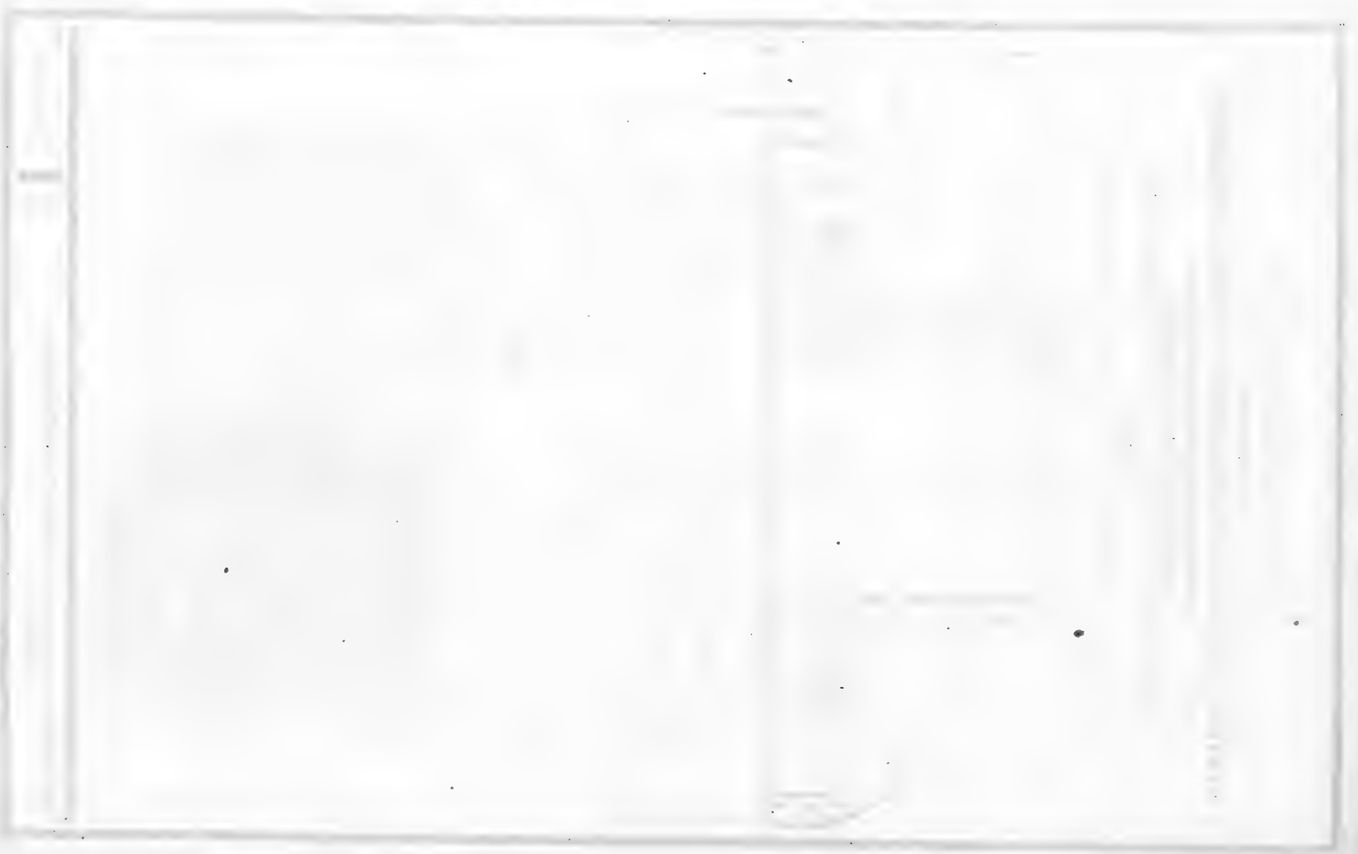
No. 3—Heavy Domestic Fuel Oil. A distillate fuel oil for use in burners where a low viscosity oil is required.

No. 4—Light Industrial Fuel Oil. An oil known to the trade as a light fuel oil for use in burners where a low viscosity industrial fuel oil is required.

No. 5—Medium Industrial Fuel Oil. Same as Federal Specifications Board Specification for Bunker Oil "B" for burners adapted to the use of industrial fuel oil of medium viscosity.

No. 6—Heavy Industrial Fuel Oil. Same as Federal Specifications Board Specification for Bunker Oil "C" for burners adapted to oil of high viscosity.

As published in the data sheets, the maximum pour point for the various oils was set at 0° F. Under the new accepted specifications, the pour point has been raised to 15° F., with the qualifying note that: "Lower or higher pour points may be specified whenever required by conditions of storage and use. However, these specifications shall not require a pour point less than 0° F. under any conditions."



Graphs and Charts

Hints on How to and How Not to Present Graphic Data

THE old adage "Figures don't lie" has been proved false more times than one by those who distorted figures to their own ends. In the same way it is possible to produce graphic representations that will convey just as erroneous impressions. An example of the distortion with which a given set of facts can be clothed is found in Fig. 1. These three graphs represent an identical condition, yet the average person looking at 1a and 1c would not at first glance get this idea. Graphs of this sort frequently are used to portray the rate of growth or development. For instance, it might be desired to show the rate of sales of a commodity during the first four months of the year. The graph 1a is best adapted to a minute analysis of sales on a time basis. That is, the divisions marking time are well spaced. If, however, the plotters of a project desire to use this graph to show the prospective purchasers of stock, in all probability it would be plotted somewhat as shown in 1c where the "steepness" of the line apparently indicates a much more rapid rate of sales than is shown in 1a.

Distortions of this kind are common where the intent is to impress non-technical minds with the rapidity of growth. Graph 1c shows an improper method of plotting these data, as the base line is started at 35,000 instead of at zero.

Fig. 2 is a good example of horrible graphic presentation. There is not the slightest excuse in the world for presenting Fig. 2 to any reader, as it would be utterly impossible for him to utilize it specifically, or even to get a general idea of what it is all about. The only words that are legible constitute the title "Comparison of Fuel Costs." The rest of the words and figures are illegible.

It is a common fault with engineers when comparing graphs to fail to realize the fact that the graph may be desired for publication, in which case all legends and figures should be exaggerated in size to allow for reduction

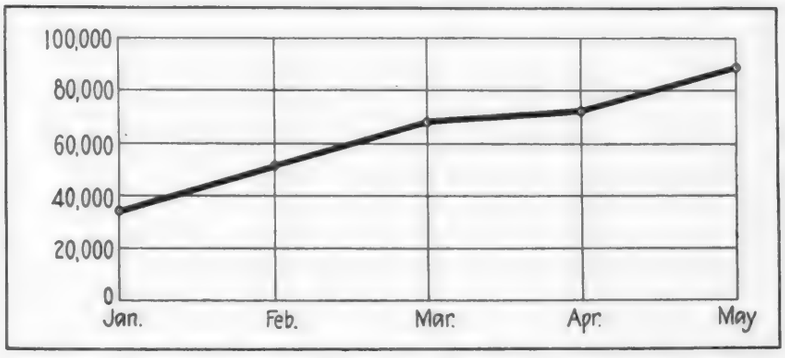


Fig. 1a (above) The Rate of Increase Appears Low When Horizontal Ordinates Are Stretched

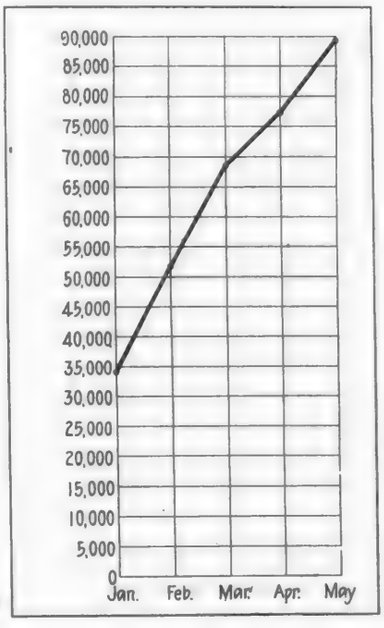


Fig. 1b (center) Increase Is Not So Exaggerated as in Fig. 1c

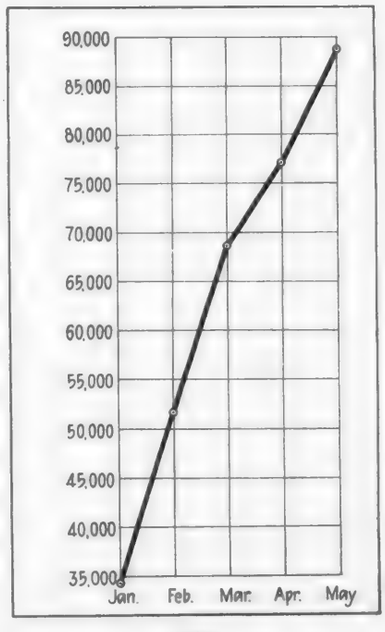


Fig. 1c (below) Vertical Ordinates Should Start at 0

when making cuts. An essential, if not a prime consideration, in preparing graphs for publication is that the reader shall be able to prick off quantities, or interpolate between lines with the desired degree of accuracy.

Graphs which are being prepared for publication should be clear and the printing somewhat larger than is necessary on charts which are merely included in engineering reports. In few cases is it wise to type the printing, as the printing is illegible if much of a reduction is made. The coordinate lines should be as few as possible in number, as a great number of lines is confusing to the eye.

Logarithmic paper has an important place in the proper presentation of graphical results and performances. This paper is so designed that rates of change can be shown as a straight line if the rate of change is constant. With the lines ruled logarithmically on the vertical axis and equally spaced on the horizontal axis, or abscissa, interesting results can be obtained.

For instance, if the sales of a commodity increase at a constant rate for the first six months of a year and then drop off for the second six months at a lower rate, and continue this over a period of years, the graph plotted on ordinary cross section paper will be a series of lines getting more and more steep as they progress to the right. Since the percentage of increase is constant, however, on semi-logarithmic paper the curves will be a series of lines of which the increase-lines will all be parallel and the decrease-lines will all be parallel.

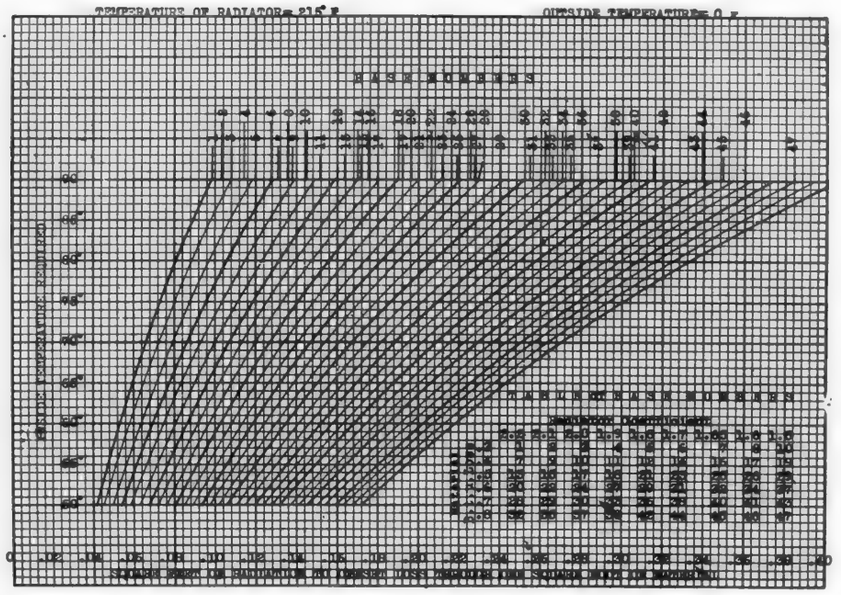


Fig. 2. How Not to Present a Graph

It is customary in sales work to expect a so-called organic growth. That is, the increase in sales from period to period will be a constant increase in percentage and not a constant increase in actual amount or volume. An increase in percentage will show up on common graph paper as a curve becoming more and more steep as it approaches the right, while on semi-logarithmic paper it will be a straight line. Whereas on the first type of paper the curve gives an over-optimistic appearance, the latter type will show it for what it is—a normal growth.

Full logarithmic paper, with both ordinates ruled logarithmically, will show a function raised to a power as a straight line.

The study of proper methods of presenting statistics graphically is a most fascinating one, and every engineer, sales manager and production manager who wishes to use graphs and charts should study carefully one of the several worthwhile books on the subject. He then will not be likely to distort his meaning by improper presentation, with misleading results to himself and others.

How to Weld Wrought Iron Pipe

SOME valuable data are contained in a recent issue of *Oxy-Acetylene Tips* on the subject of welding wrought-iron pipe. The article follows:

Due to its distinctive method of production, genuine wrought iron has properties that are quite different in many respects from low carbon or mild steel, with which it is sometimes confused. Until recently wrought iron was made almost exclusively by the puddling process. In this process a charge of pig iron is melted in a special reverberatory furnace and iron oxide is added to remove the sulphur, phosphorus and carbon in the pig iron. As the carbon is eliminated, the metal becomes pasty since the melting point of the pure iron formed is considerably higher than that of the pig iron. The purified iron is removed from the furnace in balls weighing about 400 lbs. and containing considerable of the slag formed during the purifying operation. The excess slag remains in the metal, however, and during the finishing operations this slag is distributed throughout the metal. As a result, genuine wrought iron has a fibrous structure which distinguishes it from steel.

The puddling process requires strenuous hand labor during the refining operation and is consequently not well adapted to quantity production. Recently, however, a process has been developed that eliminates hand puddling and permits increased output of a product that is even better than the older puddled iron. Molten pig iron, completely refined in a modified Bessemer, open-hearth or electric furnace, is mixed with molten slag of suitable composition. As the slag has a lower melting point than the iron, when the two are mixed in correct proportions, the iron is solidified into a spongy mass which is permeated throughout with the liquid slag. When this mass is compacted into a bloom and rolled to a billet or bar section, the resulting product is equal or superior to the highest class of hand-puddled wrought iron.

Welders should be familiar with the properties of wrought iron as it may be encountered in a variety of forms, the most important from the point of view of oxywelding being wrought-iron pipe. Important tonnages of this pipe are manufactured every year.

A puddle of molten metal always should be maintained at the point where rod is being added, the end of the rod being kept immersed in this molten puddle until enough metal has been deposited. Then the edges of the molten puddle and the surrounding colder metal should be fused together to obtain a solid union. The weld progresses by repetition of this procedure, care being taken to add no metal from the welding rod except through the vehicle of the molten puddle. In order to obtain sound weld metal free from oxide which produces low strength and porosity, the molten puddle should be disturbed as little as possible. Excessive rubbing or agitating of the molten pool should be avoided as this causes undue exposure of the molten metal to the atmosphere, resulting in the formation of oxide which is frequently trapped in the weld.

With reasonable care during the welding operation, impurities can be easily floated to the surface. Undue agitation of the puddle may also result in molten metal being spread out over un-fused surfaces, causing laps or other defects in the weld.

In welding wrought iron for the first time, the slag may tend to mislead the welder as to the fusion of the metal. The slag is disturbed throughout the metal and is more easily fusible than the iron. Accordingly when the blow-pipe flame is applied to the surface of wrought iron the slag melts first, giving the appearance of fusion before the metal has actually melted. Once recognized, this condition is easily avoided by simply making certain that the sides of the vee are actually fused before adding weld metal. It should be remembered that wrought iron can stand higher heat without damage than other ferrous materials and in general should be worked hotter for best results.

Molten wrought iron is more viscous than molten steel and consequently does not flow quite as readily. This is an advantage in welding pipe as it facilitates thorough and correct fusion at the bottom of the vee.

Another advantageous welding characteristic of wrought iron is the freedom from sparking which results from its very low carbon content. This tends to eliminate one source of oxide in the weld metal.

Gas Burner Manufacturer Adopts New Merchandising Policy

IN adopting a "Tailor-Made Plan" of merchandising Barber patented gas conversion burners, the Cleveland Gas Burner & Appliance Co., Cleveland, O., has taken a forward step, which is characteristic of the company's progress. When the company was organized twelve years ago, to market the Barber gas burner, the science and art of invention, as applied to gas-burning devices appeared limited. There was little or no past performance or previous experience on which to go. There was a decided lack of interest and practically an antipathetic attitude on the part of the gas companies and trade alike, who were not sold on new principles or "conversion" burners. In addition, the early attempts at producing such burners that could compete with gas-designed equipment met with difficulties.

At first, progress in the adaptation of the Barber principle was applied to the self-contained automatic hot water storage heater. Although a large number of the leading manufacturers of domestic water heaters and various other gas-burning appliances have adopted the burners as standard in their product, most of the company's attention was centered in the development of the Barber gas conversion burner and its combustion prin-

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The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue. Cleveland, Ohio

SPECIFICATION DATA FOR BARBER AUTOMATIC GAS BURNER EQUIPMENT

Date _____

For _____ (Name) _____ (Address) _____ (City) _____ (State)

Mfr's Name of Appliance _____ Trade Name _____ No. _____ Type _____ (Warm Air, Water, Steam or Vapor)

Direct Radiation _____ (Sq. ft.) Dimensions of firebox at grate level _____ (inches) wide _____ (inches) long If round _____ (inches) diameter

Ash door opening _____ (inches) wide _____ (inches) high. Clinker door opening _____ (inches) wide _____ (inches) high. _____ (inches) from ash door front to rear of firebox.

_____ (inches) from clinker door front to rear of firebox. _____ (inches) from top of grate to bottom of ash pit. Kind of fuel now used

Age heating appliance _____ (years) Condition _____ (Good, Fair or Poor) Rating _____ (See Mfrs. Catalog) Sq. ft. Does heating appliance properly heat bldg. with present fuel?

Is there a Gas Pressure Regulator installed? Size _____ (inches) Current _____ (D. C. or A. C.) Voltage _____ Cycle _____

Kind of Gas _____ B. T. U. _____ For _____ (Automatic or Manual) Control. Gas Service line _____ (inches)

The above information is desirable to accurately build the burner and trim upper and lower baffles to specifically fit the appliance, reducing installation time to the minimum.

The following is of material assistance to our Engineering Department:

Type of Building _____ (Brick or Frame) Outside Measurements _____ (feet) wide _____ (feet) long _____ (feet) high. Age of Bldg. _____ No. Rooms _____

Fuel cost during past Heating season $ _____ Heat Regulating Equipment Now Installed _____

Remarks: _____

FOR JOB _____ SIGNED _____

SPECIFICATIONS

_____ (Quantity) Special Barber AUTOMATIC Burner, made of _____ (Number) _____ (Style) Units, built with _____ (Inch) Gas Supply

Burner layout to be _____ (Inches) wide _____ (Inches) long; arranged to have _____ units on each side; tilted _____ degrees,

and _____ units in center. Burner layout to start _____ (Inches) from center of Manifold. Height of Pedestal _____ (Inches) high

Jet Orifices No. _____ for _____ (Kind) gas. To have (_____ (Inches)) drop.

Remarks:— _____

For _____ (Mfr's Name of Appliance) _____ (Trade Name) _____ (Number) _____ (Type)

THE ABOVE BARBER AUTOMATIC BURNER EQUIPMENT TO INCLUDE:—
(State Specifically Below)

Individual Pilot Lights.....	Safety Pilot Control..... @	
Butterfly Draft Door.....wide x.....High (Inches) (Inches)	.....Motor or Quick-acting Gas Valve, @ (Inch)	
Upper baffle.....wide x.....long (Inches) (Inches)	.....Gas Pressure Regulator, @	
Lower baffles.....wide x.....long (Inches) (Inches)	.....Minn. Thermostat, @ (No. and Kind)	
.....	Minn. Limit Control.....Pressurestat, @	
.....	Minn. Aquastat.....Pressuretrol, @	
.....	.....	
.....	.....	
Serial No.....	List Price	
Specified by.....	Less.....% Discount	
For..... Job.	Weight..... Total	

ciple, which by the addition of jets, provided for the introduction of auxiliary air above the gas orifice in the jet tubes. The important effect of this arrangement is that as the pre-mixture leaves each pair of jets, a vacuum is created which draws into the flame the additional air required to develop combustion upon increased pressures, resulting in the development of a high-temperature flame with 540 B.T.U. gas.

The new plan of merchandising these burners is expected to go far toward simplifying the entire process of marketing and installation work and to guarantee factory engineering responsibility. The principal feature of the plan consists of a specification data sheet, which is supplied to dealers, distributors, gas companies and heating contractors for their guidance in ordering the proper burner equipment for the specific appliance.

The plan was designed to simplify the process of marketing and installation. Due to the large variety of sizes, shapes and makes of boilers and furnaces, it has been more or less confusing to the dealer or gas house-heating engineer, probably to select the right burner assembly. Formerly the heating man or plumber or gas company installer would order an array of parts and make his own assemblies according to personal ideas and opinions. Sometimes they would work satisfactorily but very often there would be failures or inefficiencies, which would not fail to react to the disadvantage of the manufacturer.

Under the present plan the gas company or dealer supplies to the manufacturer the name and number of the boiler or furnace, together with other information requested on the data sheet. The manufacturer then makes up the assembly to order and accepts the responsibility of satisfactory equipment.

Progress Reports on Fuels Utilization

That the organization of the anthracite operators to carry on a research program will result in a distinct increase in the use of anthracite, is the prediction made by the Progress Report Committee of the Fuels Division of the American Society of Mechanical Engineers, in their report on "Progress in Fuel Utilization in 1928."

It was pointed out by the committee that cumulative production in the anthracite industry for the first seven months of 1928, as compared with the corresponding period for 1927, showed a decrease of 4,500,000 net tons, largely due to the severe competition from oil and coke. The decrease in production has caused the anthracite mining companies to make more intensive efforts to improve mining methods and to add labor saving equipment. Old and expensive workings are being abandoned and the larger mines are being equipped with automatic machinery in place of the old equipment. Extensive changes in auxiliary appliances are being made.

Japanese Heating Contractors Honor American Visitor

At its regular meeting, May 10, the Toka-Kai, an organization of heating contractors and manufacturers of Osaka, Japan, honored as a special guest J. P. Cosgrove, export sales manager of the American Radiator Company. Mr. Cosgrove was the guest of K. Takeda, of the Okura Trading Company, Osaka.

Toka-Kai, which has about 40 members, is devoted to the improvement and development of the heating industry in Osaka. Kishiro Murai, of the Toa Iron Works, Osaka, is president of the organization.

Toka-Kai, the Association of Osaka Heating Manufacturers and Contractors, Extends Greetings to J. P. Cosgrove of the American Radiator Company

"Standard Practice in Sheet Metal Work"

An encyclopedia of authoritative, modern standards in the field of sheet metal work has just been published by the National Association of Sheet Metal Contractors. It is one of the most comprehensive and complete books available in the trade literature of any building trade.

Sections V, VI, VII and XI are of particular interest to the heating and ventilating engineer and contractor. Section V covers Warm-Air Furnaces with 45 full-page illustrations and 21 pages of text, and includes a reprint of the sixth edition of the Standard Code. Section VI, Heating and Ventilating Systems, includes 36 full-page illustrations and 30 pages of text. Section VII contains 45 full-page illustrations and 40 pages of text on the subject of Blow-Pipe and Exhaust Systems. Section XI, Restaurant, Kitchen and Hotel Equipment, includes 13 pages.

The book contains 12 sections, each devoted to some phase of sheet metal work. It is handsomely bound and contains 494 pages of illustrations, and 274 pages of text. In its field the book is similar to the *Guide*, inasmuch as it was not written by any one individual but is made up of sections, each of which was worked up by specialists thoroughly familiar with their subject.

Published by the National Association of Sheet Metal Contractors, 336 Fourth Ave., Pittsburgh, Pa. Size 9 in. by 12 in. Pp. 768. Price $10.

This Way to Profits

Heating and Plumbing Finance Corp., 37 West 39th St., New York, has issued "This Way to Profits." This booklet already has been distributed to such an extent that a second edition was printed. It outlines for the contractor in a simple manner, (1) the enormous profit possibilities to contractors in selling their wares on convenient payment terms to the public; (2) why this method of selling must be more actively promoted if the contractor is to keep busy on a money making basis; (3) how such business is developed, listing 22 different ways, all proven efficient through actual use; (4) by illustrations and instructions, how time payment sales and papers are handled. This corporation is a financing unit of the American Radiator and Standard Sanitary Corporation, and finances the sales of all the parent company's subsidiaries on monthly payments. It maintains offices at 816 So. Michigan Ave., Chicago, in addition to New York headquarters, and offers to send a copy of this booklet to any contractor who requests it.

Cartoons Put Across Value of Building Insulation

BUILDING insulation, its value, and the savings it effects, recently were brought to the attention of the public in a series of five characteristic cartoons by Herbert Johnson, magazine artist. These cartoons, here reprinted, show Mr. Johnson's interpretations of the advantages of insulating material for homes. The series ran in the *Saturday Evening Post.*

Here is an adequate example of the use of compelling copy in heating-economy advertising. Style, health, and profits are stressed. Danger of being out of date is the feature of the two sketches, one showing a non-insulated house as a museum exhibit; the other a heat-losing home consigned to the dump of obsolescence.

Speculative builders are the target aimed at in the two cartoons showing how profits are lost through the non-sale of uninsulated houses. All through the series runs the emphasis on lower cost of heating homes which are properly insulated. Summer heat, winter chills, colds and fevers and illnesses are personified as the troublesome quartet which accompanies every uninsulated house. The series shows vividly, and in an interesting manner to appeal to home-loving men and women, how to keep this troublesome quartet away.

Present Practice in Water Heating

III. Mueller System

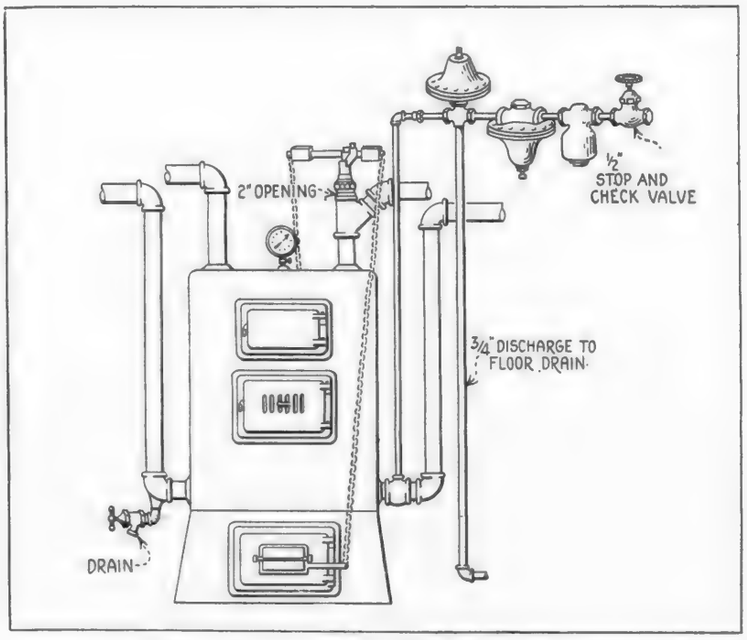
CONSISTING of an automatic boiler supply valve, an automatic boiler pressure control valve and an automatic damper control, the Mueller system of hot-water heat control is a closed or pressure system with which an expansion tank is not necessary. In addition there is a sand or sediment strainer, combined line stop and check valve and pressure gage included with the unit. The equipment listed is adaptable to any type heating boiler and to any gravity or pressure system.

The automatic boiler supply valve is so designed that it maintains a constant pressure on the boiler, keeping the system full of water under all conditions. The automatic boiler pressure control valve prevents the formation of excess pressures within the boiler by discharging water at a predetermined pressure depending on the size of the job.

The boiler supply valve is set to reduce city water pressure to a pressure sufficient to fill the entire system when the water is cold. On a two-story job, approximately 10 lbs. is sufficient. A three-story job requires some additional pressure, generally between 13 lbs. and 15 lbs. The boiler pressure control valve is regularly set for 25 lbs. and prevents pressure from exceeding that amount. A three-story job requires approximately 28 lbs. to allow sufficient differential within the system.

Approximately 45 min. are required to install this system on an old job. On a new job no additional time or expense is involved, inasmuch as the system is placed in the boiler supply line. It is not necessary to locate or pipe in an expansion tank or install special apparatus on the riser or return mains.

Operated by temperature, the automatic damper control is not affected by pressure. As the temperature increases within boiler, the volatile liquid within the unit expands, closing the draft door and opening the check door. This operation is reversed when the water cools. The system is furnished either with or without damper control and can easily be adapted for use with room thermostat controls or other automatic devices. It is manufactured by the Mueller Co , Decatur, Ill.



Boiler Connections for Mueller System

A. O. B. A. Endorses Fuel Oil Standards

At a meeting of the executive committee of the board of directors of the American Oil Burner Association recently held in New York City, the following resolutions were adopted:

Resolved: That the American Oil Burner Association accepts and heartily endorses the acceptance of the commercial standards specifications for fuel oil as presented by the commercial standard unit of the Bureau of Standards, Department of Commerce, believing these standards to be of material benefit to manufacturers, distributors and users of fuel oils and manufacturers of oil burners in clarifying the present unsatisfactory method of classification;

Resolved: That the executive committee of the American Oil Burner Association approves the proposed action of the greater New York Oil Heating Association in the matter of establishing a central filing bureau for the joint handling of all oil-burner permits and approvals by the New York Bureau of Fire Prevention and cooperation with the New York Board of Standards and Appeals; and resolved further that the executive committee recommends that the manufacturer-members of the American Oil Burner Association doing business in the city of New York, advance to the Greater New York Oil Heating Association such sums as shall in the aggregate equal $5000 to be used as may be necessary to meet the expenses of the Greater New York Oil Heating Association during the next four months. Such expenses are to be governed by the budget proposed by the Greater New York Oil Heating Association as revised by the executive committee of the American Oil Burner Association, said sums to be repaid to the lenders when, and if, the receipts of the borrowers permit.

Among others, the following committees were appointed to serve for the year 1929-30: Research committee: Harvey C. Dever, chairman; H. H. Lorenz, Harry F. Tapp, Leod D. Becker and P. E. Fansler; committee on cooperation with Underwriters' Laboratories: J. A. Hirsch, chairman, A. Klotzman, R. S. Bohn, Dudley Robinson and Harry F. Tapp; uniform oil specifications committee: J. C. Johnson, chairman, J. L. O'Brien, W. H. Camp, H. J. G. Rudolph and Harry F. Tapp; committee on cooperation with the heating industry: W. J. Smith, chairman, P. E. Fansler, J. H. McIlvane, Homer Linn and George Wright.

Apprentice Training Programs Conducted in 133 Cities

Exactly 133 classes for the training of journeymen and apprentices were conducted last year, according to the report which John J. Shanahan, chairman of the Apprentice Committee of the National Association of Master Plumbers, read before the 47th annual convention at Buffalo.

All of these classes were conducted under programs worked out jointly by local associations of master plumbers, journeymen's organizations, the local schools, and the Educational Division of the Plumbing and Heating Industries Bureau.

Luther B. McMillan

Luther B. McMillan, for thirteen years general consulting engineer of the Johns-Manville Corporation, New York, died at the St. Johns Hospital, Newark, N. J., August 10, from injuries received in an airplane accident, when the plane in which he was accustomed to travel between the Newark Metropolitan Airport and Manville, N. J., fell into a spin in marshy ground near the airport. He was a licensed pilot, capable of expert control of planes and frequently utilized this method of transportation in traveling over the wide range of territory covered by his activities.

Mr. McMillan was born at Bem, Mo., Sept. 21, 1891. He was graduated from the Texas Agricultural and Mechanical College in 1911, with the degree of B. S. M. E. At a later date he took graduate work in mechanical and chemical engineering at this institution and was instructor in mechanical engineering in 1912-13. He received the degrees of mechanical engineer in 1912 and chemical engineer in 1913.

Mr. McMillan was awarded a fellowship in engineering at the College of Engineers, University of Wisconsin for 1913-14, and received the degree of Master of Science in 1914. After serving two years as instructor in steam and gas engineering at this university and specializing in research pertaining to the science of heat transmission, with particular attention to heat transfer through insulation, he became general consulting engineer for the Johns-Manville Corporation.

Always a very active member of the American Society of Mechanical Engineers, he served on many important committees and was a member of the Council at the time of his death. His research work on heat insulation was notable. In 1914, he received the Junior Award of the A.S.M.E. for a paper entitled "The Heat Insulating Properties of Commercial Steam Pipe Covering." This paper focused attention on a subject that has been growing in importance ever since, and it is still rated as one of the outstanding contributions on the subject. Other notable papers presented by him before this society were "Heat Transfer Through Insulation in the Moderate and High Temperature Fields" and "Heat Insulation Practice in the Modern Steam Generating Plant."

He also was frequently called upon to read papers before other engineering societies and contributed many articles on various phases of insulation to the technical press, and prepared technical data for Kent's and Marks' Handbooks, the A.S.H.V.E. *Guide*, and the Handbook of the National District Heating Association.

Luther B. McMillan

From 1924 to 1928 he served on the subcommittee on heat transfer of the National Research Council, and in 1928, when the Division of Engineering and Industrial Research authorized the organization of the committee on heat transmission he was elected a member of the executive committee and also appointed chairman of the subcommittees on thermal insulation.

His services for the Johns-Manville Corporation constituted a record of marked achievement in the insulation field. Always searching for improved methods, he had to his credit the development of many important insulating materials and improvements in their manufacture and application. The thermal insulation testing laboratory of the corporation at its Manville factory, regarded as one of the most completely equipped private laboratories in the United States for investigation work pertaining to all classes of insulating materials, was established under Mr. McMillan's direction. Mr. McMillan was a member of the American Society of Mechanical Engineers, American Society of Heating and Ventilating Engineers, American Society of Refrigerating Engineers and the Society of American Military Engineers.

Clinton T. Hayes

Clinton T. Hayes, treasurer of Hayes Brothers, Inc., Indianapolis, Ind., died at the age of 55, August 19. Mr. Hayes was apprenticed to the trade at an early age and thirty years ago he formed a partnership with his brothers, Frank J. and Joseph G. Hayes, who at the time were journeymen steamfitters and plumbers. In 1903, the partnership was changed to a corporation, and in 1919, Frank J. was deceased. Joseph G. Hayes, the only surviving member of the original partnership will continue as president of the corporation.

Fred P. Calkins

Fred P. Calkins, dean of the western division of the Richardson & Boynton Company, died recently after an attack of acute appendicitis. Originally, Mr. Calkins was located at Saranac Lake, New York, and for 28 years operated from that point through the Adirondack Hardware Company. On January 1, 1913, he transferred his headquarters to the Chicago office of the Richardson & Boynton Company, and since then he had been field representative in the Chicago metropolitan and northern Illinois area.

Production of Coke-Oven Gas Increases

Information released by the statistical department of the American Gas Association, shows that for the 96 gas companies reporting for the first five months of 1929, over a corresponding period in 1928, there has been a 39% increase in the coke-oven gas produced. There also was a 22% increase in coke-oven gas purchased by coke and steel companies operating byproduct coke ovens.

The report also stated that the production of water gas has decreased 6% and that of coal gas 12% for the period stated.

Reports Coal in Ontario

Announcement was made in the Ottawa *Journal* for August 14, that investigation by the Ontario Government of reported coal deposits on the Abitibi River in the Blacksmith Rapids area, north of Cochrane, has revealed that further development is justified.

The paper stated that tests have indicated that there are extensive deposits of soft lignite of almost as high grade as that mined profitably in the Drumheller fields of Alberta. It was added that this is the first coal discovery of any consequence in the Province, and continued exploration promises to yield interesting results.

Fuels Meeting Will Discuss House-Heating

Domestic heating will receive its full share of attention at the Third National Fuels Meeting to be held in Philadelphia, Pa., October 7-10. A domestic heating symposium will be held at which papers on oil, coal, gas, electricity and coke will be read. There will be papers on "Economics of Reclamation of Anthracite Culm," "Economics of Coal, Gas and Oil Fuels," "Economics of Industrial Heating," and "Economics of House-Heating and Insulation." There also will be a paper on "Cleaning of Anthracite" and two on "Low Temperature Carbonization Plants."

Indirect Service Water Heating System

by **THAD DEAN WHEELER**

EVERY heating contractor has experienced various schemes and devices to heat water for household use from a warm-air furnace. Most of these are merely variations of the old-fashioned hot water drum in the cook-stove, where the bustling housewife could raise a lid and procure a dipperful of hot water for the dishes—provided, of course, the fire was going.

Hardly had the children ceased dressing in the kitchen on winter mornings when the next water-heating innovation appeared. This was a reserve tank for hot water in place of the above drum, or hot water tank. This tank generally was installed in juxtaposition, vertically, to the stove. Coils ran within around the sides, and frequently across the top over the hot coals within. City pressure actuated the supply of hot water from the tank to the faucets throughout the house.

After a few months the efficiency of the coil-in-the-cook-stove water heating system would begin to undergo a gradual diminuendo. The water wouldn't be so hot as it used to be, although the fire in the stove was going at a lively clip. And later, the hot water wouldn't seem to run so fast. Those of us who are near or over forty years of age, know that the hot water spigot rarely delivered the goods with the same measure of efficiency as did that of the cold. The general complaint was that "the pipes must be clogged up." And they *were* clogged up—with *scale.*

Scale, as everyone knows, is caused by the precipitation of certain mineral salts in what is known as "hard" water. An analysis of scale will vary according to locality; in regions where water is supplied by a large lake (i.e., Lake Michigan), the presence of such salts as aluminum, iron, magnesium, etc., is marked. The hot iron walls of the pipes bear such an affinity for these salts that they readily precipitate and form a hard crust within the pipe—to their subsequent complete stoppage, or rupture.

It has been the *scale problem*, then, which has been the obstacle in heating water with a coil in the fire box of a warm-air furnace.

It was not until the water heating principle, invented by Jacob Erickson, was applied to the warm-air furnace, rather than to the steam boiler for which it was designed, that a means of using the warm-air furnace for water heating could be pronounced a success.

The operation of such a system can readily be comprehended from the illustration. An ordinary warm-air furnace is used, with an iron water pipe running through the fire.

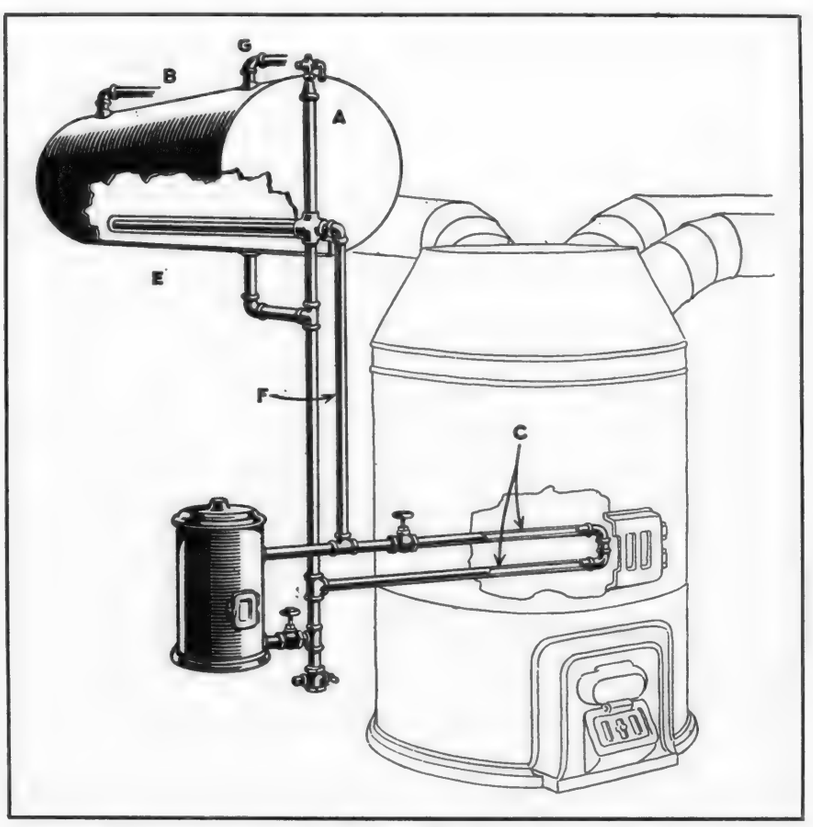
The difference from former practice lies in the introduction of a BST tube (the invention of Jacob Erickson) in the bottom of the reserve tank which is set horizontally. In this arrangement there are two tubes—one running within the other—the outer tube being of copper, the inner tube of brass. It will be noted that the inner tube ends a short distance from the end of the outer tube, which is sealed.

This double tube connects by means of two vertical pipes directly with the tube traversing the furnace fire. The *right-hand pipe* (F, in illustration) connects with the inside tube; the other, with the outer. The reserve tank is filled with water from city pressure. An elbow, joining the reserve tank with the *left-hand* vertical pipe, keeps these two pipes, the hairpin coil in the furnace, and the double tube filled with water.

As the tendency of water when heated is to rise, it will be seen that the water as soon as heated in the furnace tubes rises through the right hand pipe (F) to the inner tube in the tank. It continues through the inner tube until it reaches the end, where it falls into the outer tube and returns to the furnace through the left-hand vertical pipe.

As the double tube in the tank quickly becomes heated it can be seen that this heat is transmitted to the tank water. The small amount of water in these tubes, used over and over, does not contain enough scale-forming elements to do any appreciable damage.

It also will be noted that to the left of the furnace is a gas heater. This is an auxiliary unit used to supply heat to the tubes in summer, or when the warm-air furnace is not in operation.



Novel Arrangement of Domestic Water Heating System, Designed to Prevent Formation of Scale

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Living Comfort of Today, a booklet devoted to the importance of modern heating and plumbing in the home, has been prepared by the Plumbing and Heating Industries Bureau and is now ready for distribution. Written in narrative form, the booklet is illustrated with pen-and-ink drawings and is characterized as the only one which deals with modern heating and plumbing without reference to any particular type of apparatus. The text is designed to impress the layman with the importance of the heating contractor and master plumber as the logical distributors of heating and plumbing supplies. To date the bureau has received requests for price quotations on 125,000 copies of the booklet, which is of a size for mailing in a standard business envelope.

New Apparatus and Appliances

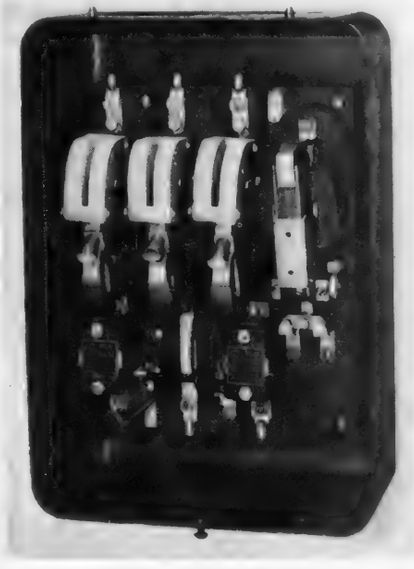
Eclipse Low Water Level Control

A low water level control for use in connection with gas-fired boilers has been announced by the Eclipse Fuel Engineering Co., Rockford, Illinois. The unit is simple and positive in operation, and utilizes a Mercoid switch, especially designed for use with this equipment. By a simple adjustment the water level in the boiler may be varied from ¼ in. to 1 in., and after once set will not vary more than ⅛ in.

The new unit was developed in connection with work on the problem of return condensation, but is particularly adapted as a boiler water level control.

Switch Throws Motors Across the Line

A magnetic switch, number CR-7006-D-30, has been announced by the General Electric Co., Schenectady, N. Y., to supersede number CR-7006-D-4, designed primarily for throwing small motors directly across the line. It is recommended for use with small motors wherever a simple direct control is required. The enclosing case is of the drawn-shell type in which plenty of room is provided for wiring. The reset button for the overload relays extends through a hole through the cover, allowing its use without removing the cover. Horsepower ratings at various voltages for the standard squirrel-cage type of motor are as follows: 110 volts, 7½ H.P.; 220 volts, 15 H.P.; 440-600 volts, 15 H.P.

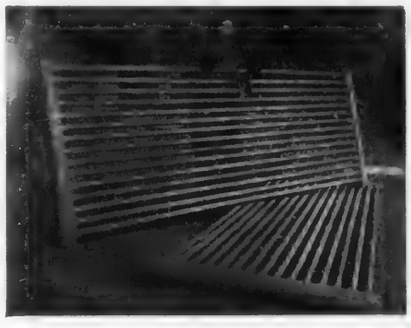


G-E Magnetic Switch

Coils Fabricated by Arc Welding

Intended for operation at 150 lb. steam pressure, the two steam coils shown in the accompanying illustration were welded in 26 hrs.

Although these coils were designed for steam ovens, they are similar to those used in the heating industry. Arc welding had not been resorted to previous to this job for this type of work, as it was realized that an imperfect arc welded joint would lead to difficulty and expense in repairing. However, one of the welders at the Westinghouse Electric and Manufacturing Company said the job could be done and welded absolutely steam tight. He was allowed to try the welding of these coils as an example. They were tested when completed under 500 lb. pressure, and were found absolutely tight at every joint.



Arc-Welded Steam Heating Coils

Worthington Timken-Equipped Small Compressors

A new line of small air compressors, employing Timken roller bearings on the main crankshaft journals, is announced by the Worthington Pump and Machinery Corp., Harrison, N. J. Limited to capacities from 100 to 300 cu. ft. per minute, the line—which is a single, horizontal, straight-line series—is of interest to smaller users of compressed air. Elimination of bearing adjustments is said to remove the principal item of expense and operation of small compressors.

Crankcase enclosure is designed for oil-tight operation. "Feather valves" are standard, while automatic regulation may be provided optionally.

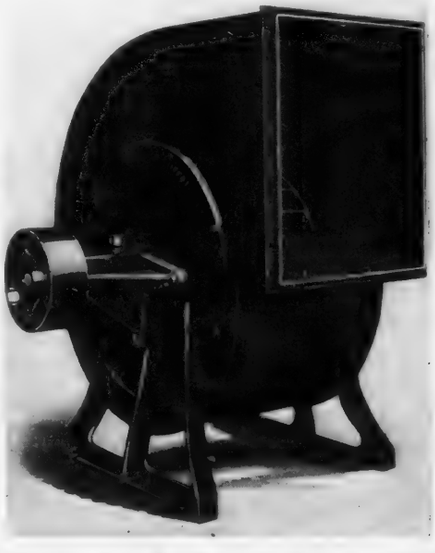
Partial View of Silex Conoidal Fan Rotor

Buffalo Silex Conoidal Fans

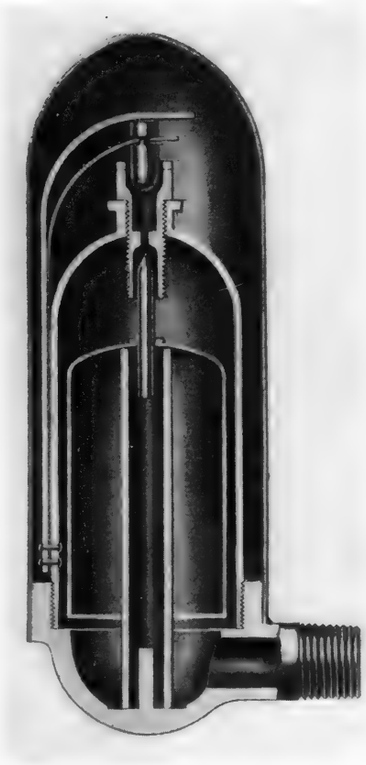
Designed to reduce audible noise to a minimum, the Buffalo Silex Conoidal fan has been announced by the Buffalo Forge Co., Buffalo, N. Y. The housing is a "rolled-up evasé stack" which converts air velocity leaving the rotor into static pressure. The discharge cone is carried out beyond the casing in order to get the best conversion efficiency and to provide an extremely quiet stream line fan cut-off.

The Silex fan rotors have double curved blades, retaining the operating characteristics and efficiency of the Duplex Conoidal design. Double curved Silex wheels will deliver the desired air capacity even though the resistance is somewhat different than specified, and the horsepower will not vary to an appreciable extent. The field of application of this fan is primarily for low-pressure ventilating work.

These fans are available in 48 sizes with single width or double width outlets.



Buffalo Silex Conoidal Fan



Chadeayne Radiator Air Valve

Chadeayne Radiator Air Valve

Chadeayne vapor-vacuum radiator air valve is announced by George D. Chadeayne, 187 Sixth Ave., Brooklyn, N. Y. Mr. Chadeayne formerly was connected with the Gorton Heating Corp., New York. Features of the new valve are its ability to create a vacuum through pumping action, its double shell for mechanical protection, the arrangement whereby the valve has no contact with seat when idle as in summer, thus preventing corrosion, and its ability to relieve air without forcing a ball or flap check to open.

The open float operates within the inner shell against its own seat to prevent the escape of water, if any. Air is relieved through the passage-way of the valve.

The heat of the steam coming into the inner shell is conducted through the shell to the thermostatic metal strips which act to deflect and close the valve against the escape of steam.

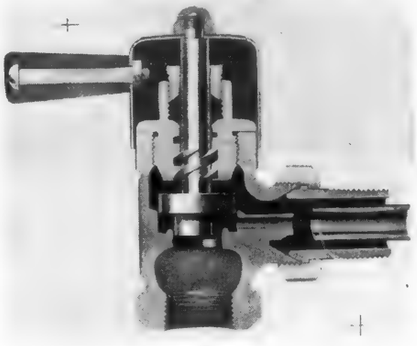
When the steam supply diminishes the strips are designed to keep the valve seated until a vacuum forms. With continued cooling and a greater vacuum the larger strip is free to move away, being unattached to the valve, while the vacuum prevents the smaller strip from moving the valve off its seat. The vacuum is preserved until leaks in the system destroy it, when the smaller strip lifts the valve from its seat.

Test of Cryer Control Valve

Working on the theory that ultimate success in the control of steam heating would be obtained through the radiator supply valve, engineers of the D. G. C. Trap and Valve Co., Inc., 292 Madison Ave., New York, have proposed a novel solution to the problem. Their solution is a radiator supply valve which restricts or throttles the amount of steam admitted to the radiator. In addition, it mixes this small amount of steam with the air already in the radiator.

In a test recently completed at Vanderbilt University on the Cryer valve, results favorable to it were obtained. Apparatus set-up included a 40-ft., 2-col., water-type radiator with steam at ¼ lbs. pressure, discharging to the atmosphere. Eight thermometers were inserted in important positions on the radiator. These were the top, bottom, ends, and middle. Total area of radiation was 40 sq. ft.

Performance figures, taken from the curve supplied, indicate a temperature variation of the radiating surfaces of from 92° (F.) at one-eighth open position of the valve, to approximately 212° at three-quarters open position. At one-quarter turn of the valve the average temperature indication of the eight thermometers was 107°. At one-half open the reading was 129°.



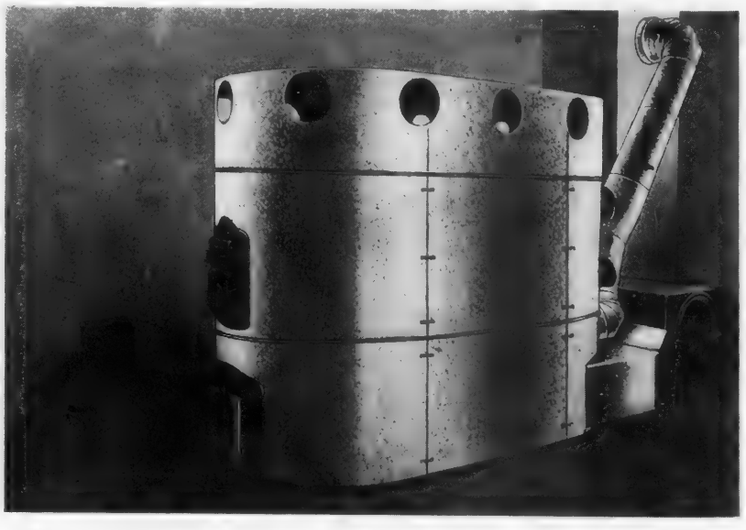
Cryer Control Valve

Temperatures lower than 212° result when a small quantity of steam at about 212° (F.) and a larger quantity of relatively cool air are mixed. It is on this fact that the principle of operation is based. So long as the air and steam are continuously mixed and circulated through the radiator, the temperature of the whole radiator may be varied at will by throttling the steam supply valve.

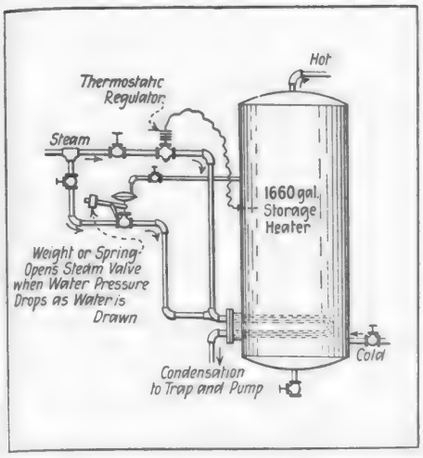
Oil-Burning Warm-Air Furnace

An oil-burning warm-air heating system is announced by the Langenberg Mfg. Co., St. Louis, Mo. The furnace is composed of a riveted steel combustion chamber 29 in. in diameter and equipped with two economizers connected to the combustion chamber. Each of these has an air flue running vertically through them which serves to give additional radiating surface and prevent stratification of the flue gases passing around them. The total heating surface is 207 sq. ft. as compared with 75 sq. ft. in a coal-burning furnace of the same combustion chamber dimension.

The middle section of the casing opposite the hottest part of the furnace is lined with three layers of air-cell asbestos held in place by corrugated galvanized iron. Two large size vapor pans supply the moisture. The complete unit includes the combustion chamber, two economizers, casing, canopy, cold air shoe, outlets for leaders and smoke pipe, and one 1/6 H.P. three-speed motor, driving an 18-in. propeller-type fan with electrical control.



Langenberg Oil-Burning Warm-Air Furnace


Hot
Thermostatic Regulator
Steam
1660 gal. Storage Heater
Weight or Spring Opens Steam Valve when Water Pressure Drops as Water is Drawn
Cold
Condensation to Trap and Pump

Unique Water Storage Heater Connection

Controlling Temperatures in Water Storage Heater

A method of controlling the water temperature in a storage heater by using a combination of diaphragm valve and thermostatic regulator, has been devised by the engineer of the Merrymount Laundry, Norfolk Downs, Quincy, Mass. The laundry obtains its hot water supply from a Whitlock type "K" storage heater, with a capacity of 1660 gallons. Formerly the water was heated to a fairly uniform temperature in the neighborhood of 160°, steam supply being controlled by a thermostatic regulator.

The heater was equipped with three thermostatic tappings and the tapping was used which was found to provide the best temperature control through the thermostat. However, when depending wholly on the thermostatic regulator, there were considerable peaks in the steam demand, resulting in a fluctuating pressure in the steam boiler.

As a means of overcoming this condition, the engineer conceived the idea of running an independent steam supply to the tubes of the heater, and controlling the steam admission through a diaphragm valve, closed by normal water pressure, and opened by a weight or spring when the water pressure in the heater becomes reduced as the water is drawn.

Under conditions of operation, when the diaphragm control valve is operated by water pressure, the temperature regulation is better than that obtained by the thermostat when the water is heated from 45° to 160°. With the hand valves in the line running to the thermostatic regulator, the flow through either method of control can be regulated as desired.

Cliff Steel Sectional Boiler

The Cliff steel sectional boiler has been announced by the Terre Haute Boiler Works Co., Terre Haute, Ind. Passage of the products of combustion is from front to rear, through flues to the front, then through additional flues to the rear of the boiler and thence to the stack. Intermediate sections are made in two sizes, 16 in. and 24 in., making varied capacity boilers possible with but three to five pieces. All sections will pass through an ordinary door or window.

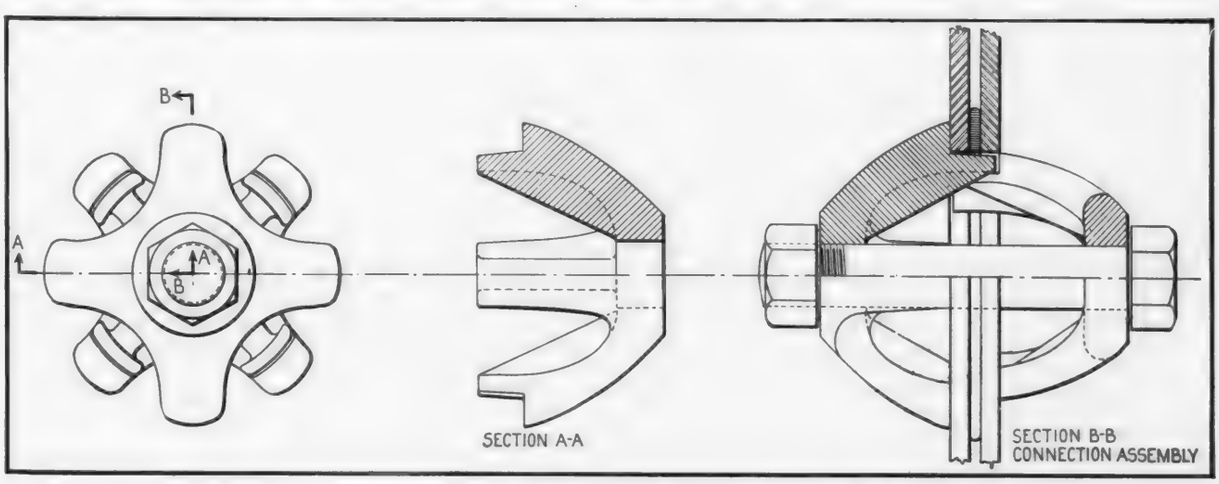
Section of Cliff Steel Boiler

Cliff Jacketed Steel Boiler

These boilers are made of 5/16 in. steel, electric arc-welded. The sections are connected with a special connection so designed as to reduce assembling costs. A large combustion space is provided, but when local smoke ordinances require, a standard smokeless feature can be supplied upon request. The boiler has a low water line.

Completely enclosed in a steel jacket, made without bolts, the casing is lined with standard insulation and finished in gray enamel trimmed with black.

Single size boilers can be supplied in six sizes, with steam rating ranging from 650 to 2500 sq. ft. of radiation, and two additional sizes for oil only, with 2900 and 3500 sq. ft. of radiation capacity. Twin boilers are available in sizes from 2600 to 5000 sq. ft. of steam radiation capacity, with two additional sizes for oil burning of 5800 and 7000 sq. ft. capacity.



Details of Connection Used Between Sections of Cliff Steel Boiler

Thrush Electric Water Circulator

Thrush Electric Water Circulator

An electric-driven circulator for hot water systems has been announced by H. A. Thrush & Co., Peru, Ind. It is recommended for oil and gas-fired boilers, greenhouses, garages, apartments, and store buildings. It can be furnished for either 110 or 220 A.C., 60-cycle motor for light or power line, and is available in two sizes for either 2-in. or 3-in. tapping. The capacities of the two units are 30 and 70 gal. per min., which will supply 2500 to 6000 sq. ft. of radiation

Frank Heat Reclaimer

A waste heat reclaimer consisting of a series of units hung vertically into a concrete pit or steel tank has been announced by the O. E. Frank Heater and Engineering Co., Inc., Buffalo, N. Y. The purpose of the device is to absorb the heat from water or liquids which otherwise would be run into the sewer at a high temperature. The waste water from laundries, for instance, has a large amount of heat which can be used for useful purposes.

The liquid at the high temperature flows into a pit or tank and passes up and down around the units which resemble automobile radiators, the flow being directed by copperized-steel baffles or partition plates.

Water to be heated passes through the tubes of the reclaimer, flowing from one unit to the other before finally passing to the heater. In the case of laundry installations, where the water piped through the water heaters has been at a temperature of approximately 50°, the temperature can be raised by the reclaimer to approximately 100°, depending upon the temperature of the waste wash water.

Tubing used in the device is made of heavy gauge Admiralty metal, the tubes being bent into U-shapes and both ends tightly expanded into heavy metal tube sheets. The header section is made of cast iron. The apparatus is so designed that the counter-current principle is used throughout.

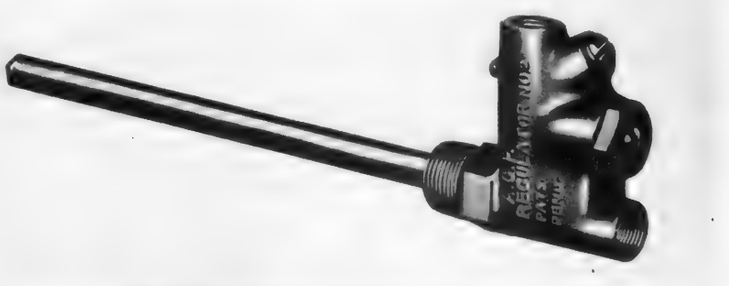
Sections for the units are all interchangeable and it is not necessary to by-pass the entire reclaimer in case of cleaning or repairs.

Control for Gas-Fired Steam Radiators

A thermal control for the gas-fired steam radiator, manufactured by the American Gas Products Corp., New York, has been announced by that company. The A.G.P. thermal control permits of greater operating economy. It gradually throttles the gas supply as the internal radiator temperature increases. It is made of cast bronze with a non-tarnishing silvery finish, and is easy to clean and compact.

Gas consumption is reduced when a vapor has been produced, long before a steam pressure has been built up.

Gas-fired radiators with these controls are available in 18 sizes without flue connections, and 6 sizes with flue connections.



Thermal Control for Gas-Fired Radiators

Perfection Model C Oil Burner

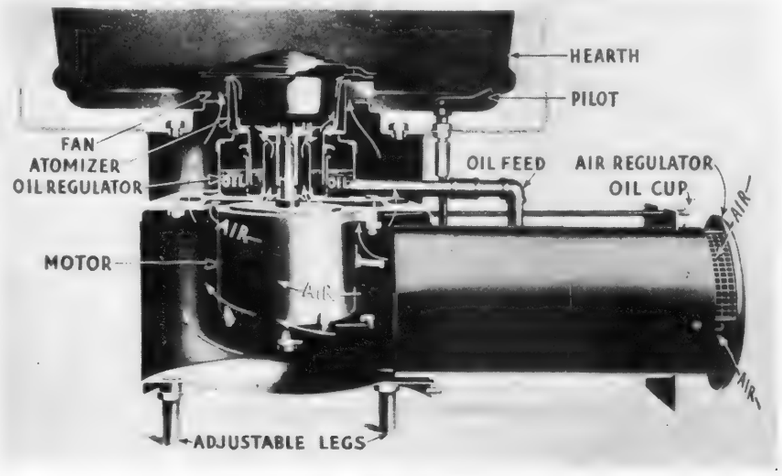
A rotary type oil burner, Model C, equipped with a vertical shaft motor and designed for installation in the ashpit of the furnace, has been introduced by the Perfection Stove Co., Cleveland, O.

Oil is fed by gravity from an inside tank or by a wall pump when the storage tank is installed outside. Air for combustion is supplied by a fan mounted on the atomizing cup, the air first being drawn through a tube and played upon the motor. It is then forced inside and outside of the reservoir and atomizing cup, blown across the hearth where it is heated and finally used in combustion.

The burner is constructed of pressed steel throughout, riveted and welded together. The metal is protected against corrosion by being subjected to a rust resisting process after which two coats of baked enamel are applied.

Aside from the motor itself, the rotating part consists only of the atomizing head which is a single unit. Ignition is by gas; the pilot light is so designed and located in the hearth that an expanding flame is not necessary.

Safety controls are incorporated to guard against abnormal operating conditions, and the burner is fully automatic. In cases of ignition failure, momentary current failure, or combustion failure, the burner either ceases to operate or recycles. Installation of the burner is extremely simple.

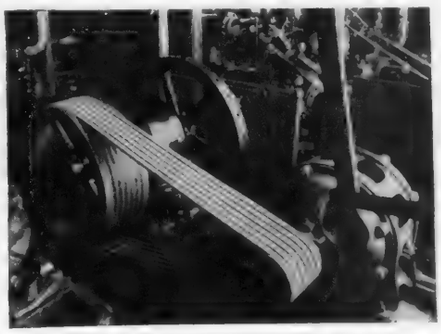


Perfection Model C Oil Burner

Cog-Belt Drives for Industrial Service

Marketed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., the Cog-Belt drive is an important addition to the type of power transmission drive. It is manufactured by the Dayton Rubber Mfg. Co., Dayton, O., and consists of one or more Cog-Belts operating in the grooves of a driving and a driven pulley, the number of belts used depending upon the horsepower to be transmitted, the speed and the characteristics of the driven load.

The Cog-Belt derives its name from the series of tooth-shaped corrugations on its inner surface. The cogged surface is not for the transmission of power, but provides flexibility and prevents buckling when the belt is flexed around the pulley.



Cog Belt Drive

The outer portion, which is under tension, consists of a series of convolute layers of a bias-cut elastic fabric. The neutral zone, between the compression and tension zones, is made up of a strength member, consisting of a series of layers of pre-stretched parallel cord cable fabrics.

Tube and Flue Cleaning Brush

Adaptable for many domestic and industrial uses, such as cleaning flues, ventilating ducts, and boiler tubes, the Springclean flue and tube cleaning brush has been announced by the Specialty Mfg. Co., Cleveland, O. Instead of the ordinary wires or bristles set radially into the twisted wire handle, the head of this brush is composed of a number of eccentrically wound spirals of tempered, high-carbon steel, flat wires with square corners. The axes of the wire circles thus formed are parallel to the twisted wire central support, and each spiral passes through the support and is firmly secured. The remainder of the spiral is free to adapt itself to the shape of the tube to be cleaned.

The Springclean brush is made in two types—the first having a five-foot flexible twisted wire handle for cleaning flues and air ducts, and the second having a shorter and stiffer handle from 4 to 5 in. long, intended for cleaning scale from boiler tubes or for other jobs in which a flexible rotary shaft is used.

400 Water Circulators Solve District Heating Problem

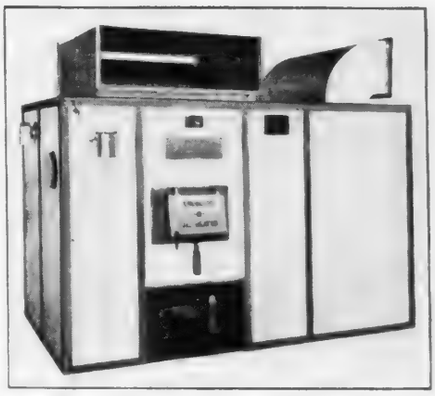
Installation of 400 Rochester "Circulator" forced-water circulation machines solved a problem that faced engineers in the recent change at Indianapolis when district steam heating replaced the old water-heating system.

A large section of the older part of Indianapolis had been served by district water-heating mains of a local public utility company. The mains had deteriorated; great leaks had developed. Extra water had to be added until the system required 100% make-up water. It was determined to replace the water heating with district steam heating.

However, replacement of the individual heating systems in the buildings was too costly to be considered. Heat exchangers therefore were installed, the district steam giving up its energy to the water in the heating system of each building. Repeated tests, moreover, indicated that the average diameter of the risers to the radiators in these old buildings was 3/16 in. Natural circulation through these small pipes would be very poor as the individual systems had been designed for the use of high-pressure steam heating.

Circulating machines were decided upon. Plans of installation were standardized and the work divided among twelve local heating contractors who are installing the machines rapidly. It is expected that the work, begun in May, will be completed by fall.

Circulators Installed in Heating Plants in Indianapolis



Kruse Oil-Burning Furnace

Kruse Oil Furnace

Kruse oil furnace is announced by Kruse Co., 353 West 16th Place, Indianapolis, Ind. It is designed to supersede the usual combination of an old coal furnace and a new oil burner. An increased amount of heating surface is obtained by surrounding the combustion chamber with radiators designed to double the heating capacity and utilize all the available heat in the oil. Another feature is a humidifier which is rated at an evaporation capacity of 0.96 gal. of water per hr. at 175° register temperature. Four sizes of these warm-air furnaces are available, ranging from 700 sq. in. to 1892 sq. in. leader pipe.

Buckeye Heatovent Series 900

Designed to meet the demand for a lower unit and one requiring less aisle space, the 900 Series Buckeye Heatovent has been announced by the Buckeye Blower Co., Columbus, O. The copper tube radiator which will not burst from freezing, is divided into two sections, each having an automatic gradual acting control valve on the steam supply. The bottom section is used to temper the incoming air sufficiently to prevent the upper section from freezing when the automatic valve on the upper section is closed.

With this arrangement both the upper and lower sections can be controlled by a room thermostat with a gradual acting valve on each section, so arranged that the top section shuts off first, followed by the gradual throttling of the steam supply to the bottom section.

Any Heatovent of this series can be changed from a non-recirculating to a recirculating unit and vice versa, by operating the combination intake and recirculation damper.

Air delivery is from 600 to 1500 cu. ft. per min. per unit; the height is 34 in. so as to permit installation under practically any window; depth is 9½ in. when recessed, while the total width is 20 to 60 in., depending on the capacity.

Double Adjustment Control For Warm-Air Furnaces

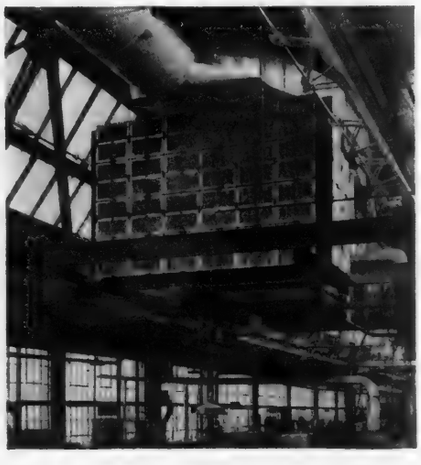
A Mercoid double-adjustment control employing the tipless Mercoid switch independently mounted, and used as a limiting device in connection with automatic draft regulation to prevent overheating of warm-air furnaces, is announced by the Mercoid Corp., Chicago. In addition, the device operates the furnace fan motor when the furnace-hood temperature has reached a predetermined limit by breaking the fan motor circuit. Temperature of the furnace duct is indicated by this instrument. A simple, quick-change adjustment is provided both for high and low points so that any required differential and temperature within its range may be secured. A glass front control brings the dial readings clearly into view. Electrical limit of the device without starting switch or relay is 10 amperes at 110 volts, or 5 amperes at 220 volts, either A.C. or D.C.

Ozone Generator

Corozone, a new ozone generator, for use in combating undesirable odors in offices, homes, factories, restaurants, and other places, is announced by Corozone Co., Hanna Bldg., Cleveland, O. According to tests by Prof. R. C. Hummel of the Department of Chemistry of the Case School of Applied Science, this device liberates from 0.8 c.c. to 1½ c.c. ozone in a 15-min. run. The device also is being sold for use in greenhouses where ventilation is likely to be poor in winter. Corozone operates on 110-volt a.c., and its dimensions are 4 in. x 5 in. x 8 in.

Dust Collector Cuts Cleaning Costs

Removal of floating, fine wood dust from the woodworking plant of the Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., was recently achieved by the installation of an overhead system of three 500 C.F.M. panel air filters designed by the Staynew Filter Corp., Rochester. In winter, warm, clean air is recirculated through ducts to various parts of the factory, while in warmer weather the air is taken from the outdoors and filtered from dust and dirt.

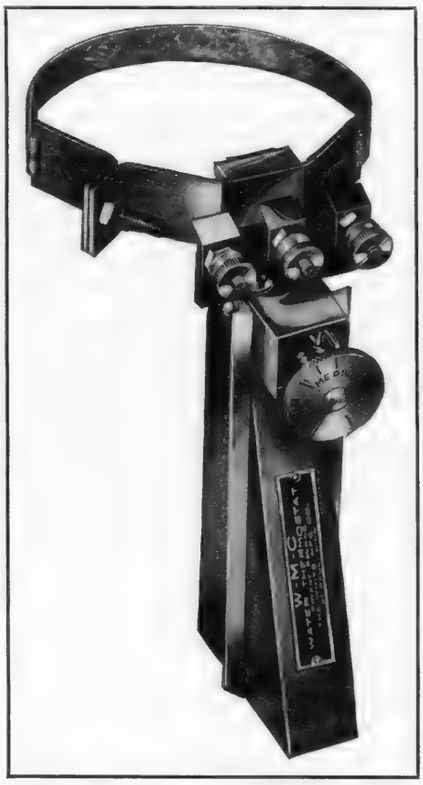


Filters Installed in Woodworking Shop

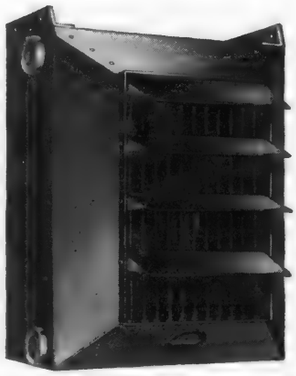
W-M-C Water Thermostat

Designed for water-temperature control in hot water systems for house-heating, the W-M-C water thermostat has been placed on the market by the White Mfg. Co., St. Paul, Minn. It can be used in connection with all types of electric damper regulators. Its function is automatically to shut off the heat whenever the water temperature in the boiler reaches a maximum point. Variation of this maximum point may be accomplished by moving the dial to any value from 80° F. to the boiling point. Being clamped to the riser, installation can be made without draining the boiler or interfering with the fire. Direct contact of the thermostatic element is made with the pipe. This arrangement brings the element in metallic contact with the water. Because of the short path of heat travel, the instrument is said to respond to the slightest change in water temperature.

Protection from draft and varying basement temperatures is provided by an adjustable case, fitting tightly to any size of pipe.



Thermostatic Control for Water System



Autovent Super Type Unit Heater

Autovent Super-Type Heaters

A new unit heater, designed for industrial and garage use and available for either floor or ceiling mounting, has been brought out by the Autovent Fan & Blower Co., 1805-27 North Kostner Ave., Chicago, Ill., under the name of the Autovent super-type heater. All of the desirable features of the Autovent heater, it is stated, have been retained. Adjustable deflectors at the front of the unit direct the heated air at any desired angle, while a taper discharge acts to increase the velocity of the air leaving the heater. An air chamber is provided between the fan and coil to permit the air coming from the fan to spread out before striking the coil, so as to insure more even distribution.

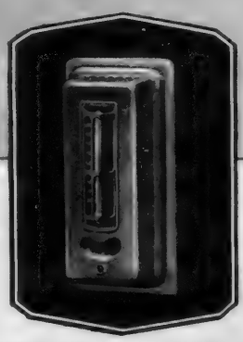
All of these heaters are furnished with a coil, which may be used on steam pressures up to 150 lbs. pressure. Seamless copper tubes and closely-spaced copper fins comprise the tubes which are connected to semi-steel headers in such a way as to obviate the use of solder, brazing or similar methods of bonding. Sizes available range from units of 212 sq. ft. capacity to those of 2200 sq. ft. capacity.

Capitol Unit Heaters

A line of Capitol unit heaters, both suspended and floor-mounted types, has been announced by the United States Radiator Corp., Detroit, Mich.

The standard types are available in both single and double designs. The single standard unit heater can be supplied in two sizes, the first of which is equipped to operate at either 1750 or 1160 R.P.M. The second can be supplied to run at 4 speeds. The large size has a maximum rating of 210,000 B.T.U. per hr. at 5 lb. steam, with entering air at 0°. The twin size suspended type is available in three sizes, while the floor-mounted type equipped with recirculating box is available in five sizes.

MICHIGAN BELL TELEPHONE CO.
BUILDING, DETROIT, MICH.
Architects and Engineers:
SMITH, HINCHMAN & GRYLLS
Heating Contractor:
HARRIGAN & REID CO.



The Powers Vapor Disc Thermostat

Does not need to be adjusted or overhauled annually. Often gives 15 to 20 years of accurate control without repairs.

Judging Future Service by the Past

BACK in 1919 the first eight stories of the Michigan Bell Telephone Co. building were equipped with the Powers System of Temperature Control. So satisfactory was the service obtained from this installation that early in 1929 when 12 more stories were added the Powers System of Control was again installed, making a total of 400 thermostats and almost 800 valves.

We build SERVICE into Powers Control—use great care in its proper installation—make frequent inspections to insure exact control at all times and this SERVICE continues throughout the life of the building in which the apparatus is installed.

Powers Control costs more; it's worth more—because, it often gives 15 to 20 years of dependable control with practically no expense for repairs.

THE POWERS REGULATOR COMPANY

35 Years of Specialization in Automatic Temperature Control

CHICAGO 2718 Greenview Avenue ∽ Offices in 35 Other Cities ∽ NEW YORK: 137 East 46th Street

The Canadian Powers Regulator Co., Ltd., Toronto, Canada

POWERS

New Trade Publications

Data Book on Arcoblast heaters arranged especially for the use of architects and heating and ventilating engineers, has been published by the American Radiator Corp., 40 West 40th St., New York. After describing in detail the construction features of the Arcoblast encased section heater, which is designed for pressures from 5 to 200 lbs., special attention is called to the one-piece cast-iron header and the thin wound copper tubing of which the heating surface is formed.

No less than 14 data tables are included covering final temperatures and condensations for steam pressures of 5 lbs., 50 lbs., 100 lbs. and 150 lbs. gauge, for heaters from 1 to 6 rows deep and for air velocities ranging from 600 to 2000 F.P.M. Other data in the booklet refer to physical dimensions, air friction, recommended air velocities and supply and return pipe sizes. A useful temperature chart is included, making it easy to determine the final air temperatures and total condensation per hour. The booklet concludes with a number of typical piping diagrams. Size 8½ in. x 11 in. A.I.A. file No. 30P4 Pp. 28.

Insulation is the title of Bulletin No. 300 of the General Insulating and Mfg. Co., Alexandria, Ind. Rock Wool and its incorporation into block brick and cement is featured. Physical characteristics such as crushing strength, shrinkage at various temperatures, and shipping weight are described for block and brick. Covering capacity application and special uses of Gimco K-14 insulating cement and Gimco Hard-K insulating cement also are given. The efficiency of Rock Wool is illustrated in an authoritative table showing the thermal conductivity of a variety of insulating materials.

Gas, the Last Word in Convenience is the title of an illustrated folder of the B-Line Boiler Co., formerly the C. L. Bryant Corp., East 131st St. and Taft Ave., Cleveland, O. Descriptive sketches show freedom from fuel storage and ash removal, when gas is used, as well as the advantages of cleanliness and freedom from worry.

American Heat Hustler, embodying an electrically-operated fan for use in a warm-air furnace, is presented in a folder issued by the American Foundry & Furnace Co., Bloomington, Ill. The unit is furnished in various types designed for installation in a single warm-air pipe to give positive delivery and direction of flow in that pipe. One arrangement provides for a vertical air discharge from a horizontal inlet, obviating the need of an elbow. Another arrangement has a horizontal inlet and discharge with a right-angle turn in the pipe. The company also manufactures a by-pass type in which the air flow is free and unimpeded when the fan is not running. This type can be installed anywhere in the warm-air run between furnace and stack, boot and riser. It contains a back-pressure damper which operates automatically. Two sizes of Heat Hustler are furnished, a small size for connection to an 8, 9, 10 or 12-in. warm-air pipe, and a large size for a 14 or 16-in. pipe. The smaller size has an air delivery of 500 cu. ft. per min., and the larger, 1200 ft. per min.

Richmond Heatomat and Gas Boiler is the subject of a catalog received from the Richmond Radiator Co., 2220 Chestnut St., Philadelphia, Pa. The Heatomat gas boiler is of vertical tubular design, each boiler section being equipped with effective baffles which diffuse the heat from the flue gases. A device called a Heatomat preheater for water boilers is described in this catalog. This device preheats the cold return before it enters the boiler by utilizing the heat in the flue gases passing from the boiler to the chimney. The preheater can be used only where the return lines leading to the boiler are above the water line of the boiler. Capacity and dimension tables for the various types of Heatomat gas boilers, together with selection curves and operating cost data, are presented in this book. Size 8½ by 11. Pp. 20.

Monroe Oil Pump, type TRU, is described in a broadside received from the Janette Mfg. Company, 556 West Monroe St., Chicago, Ill. One of the special features of this device is the quietness of operation. Tests were run on the pump for 8 months, 9 hrs. every day, excluding Sundays, pumping oil at the rate of 30 gal. per hr. Over 40,000 gal. were pumped and the pump received no attention beyond two oilings of the motor. At the end of this run there was no appreciable wear on any part of the pump.

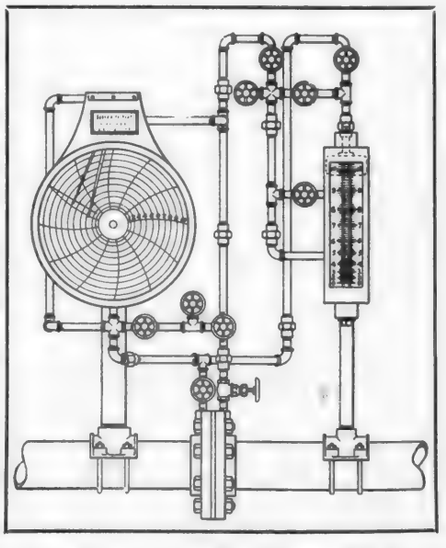
Some Switch, is the title of a broadside received from Allen Bradley Co., Milwaukee, Wis., describing the across-the-line switch made by that company. A list of the applications of this switch includes a photograph and description of an automatic stoker installation.

Ellison Pointer Draft Gage is featured in bulletin 10-A published by the Ellison Draft Gage Co., 214 West Kinzie St., Chicago, Ill. An element for converting movement along an arc into a straight-line movement is used in the gage. The movement consists of a system of correllated levers with an inverse incremental gravity loading, mathematically correct in relationship, thereby providing a pointer movement that gives a true arithmetical indication of the actuating pressure over the entire range of a straight-line scale of uniform spacings.

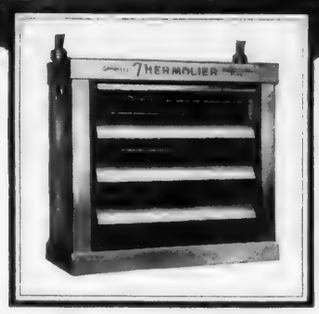
Kennedy Valves, Pipe Fittings and Fire Hydrants is the title of Catalog 48, issued by the Kennedy Valve Mfg. Co., Elmira, N. Y. It is devoted principally to the company's extensive line of gate valves, globe valves, check valves, malleable and cast-iron pipe fittings. Complete tables of dimensions are included. Size 5 in. x 8 in. Pp. 204.

Trahern Rotary Gear Pumps are described in Catalog No. 54 issued by the Geo. D. Roper Corp., Rockford, Ill. Trahern pumps are manufactured in capacities from 1 to 250 gal. per min. Rotary pumps for use in connection with oil-burner installations to pump fuel oil from storage tanks to the oil burners are featured, with illustrations of typical installations.

Testing the Accuracy of Recording Heater with a Meriam Manometer is the caption of bulletin No. 258 of the Meriam Co., Cleveland, O. The testing of recording meters may be done by either a portable apparatus consisting of a 30 or 50-in. Meriam manometer or by a Meriam indicating flow meter which will test the recording meter continuously. Piping diagrams for connecting up either type of this testing equipment are presented.



Meriam Indicating Flow Meter for Testing Continuously Recording Meters



Made in eight models to fit any space and every condition

"What! Jersey mosquitoes in winter?"

"YOUR confounded unit heaters have brought back the mosquitoes!" said a foreman at Hasbrouck Heights, New Jersey plant of the Fokker Aircraft Corporation of America.

The Grinnell service man was relieved when the foreman smiled and said that he could think of no better proof of Thermolier efficiency.

"Take this building"—he said (See illustrations) "Sheet metal construction, with no insulation whatsoever. And no basement. And planted out here in this wind-swept meadow. Hundred feet sq. and 35 feet to the trusses.

"The whole front of the building swings open almost hourly to admit one of the big wings or to roll out the completed plane. We assemble the big fellows here.

"Yet we keep a constant, uniform temperature of 60 degrees. You can see that the men work in their regular overalls. No time off from colds and a lot better morale."

"How do you mean, morale?" asked the Grinnell man.

"Cold drafts, for instance. You'd be surprised after you've yelled "Close that door" a few hundred times a week your disposition gets shot, and you take it out on the other guys and on your work."

Seven Grinnell Thermoliers strategically located, keep this sheet metal building at 60 degrees. So, when the side of the building swings open, the Thermoliers automatically turn loose their maximum heat to overcome the drafts. Then they slip into their loafing load, fan off, no forced draft and consequently practically no condensation or use of steam. For the quantity of heat given up by the incoming steam is, of course, equal to that absorbed by the fan-driven air.

Lowest possible labor costs for installation and maintenance. You fit Thermolier to your space, not space to your heating system. No buried pipes, no basement boiler room. Eighty to ninety per cent less joints, valves, traps, etc.

Thermolier's special cooling leg is right in the unit. The return trap is square up against the heater itself.

This is only one of the 14 advantages making Grinnell Thermolier a *better* unit heater. Booklet detailing these 14 points of superiority gladly sent on your request. And no salesman's call without your request.

Please attach coupon to your letterhead and mail today.

GRINNELL COMPANY

Executive Office: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

Address_____

City_____

New Developments in Oil Heat is the title of one of the most attractive consumer booklets which have been issued in the oil-burner industry. It is published by the Winslow Boiler & Engineering Co., Chicago, and besides containing descriptions and illustrations of the No. 805 Kleen-Heet Burner, it presents in an interesting and pleasing way sales arguments for automatic heat, more especially oil burning and particularly the No. 805 Kleen-Heet. Size 8¼ in. by 12½ in. Pp. 23.

Did You Entertain in the Kitchen Last Winter? Is asked on the cover of a consumer folder received from the International Heater Co., Utica, N. Y. It contains another story of the Cold Family Robinsons who entertained their friends at bridge in the kitchen last winter and are still trying to live it down. Illustrated with cartoons by Plaisted, the folder is attractively presented in both appearance and text.

Hart Highways are Happy Ways is the title of a broadside received from Preferred Oil Burners, Inc., Peoria, Ill. A series of billboards, on each of which appears a caption telling of the advantages of oil heat, is shown along a winding road, ending in a house over which is the caption "Home Is Where the Hart Is."

Year 'Round Comfort and Fuel Saving for Every Home is the latest booklet of the Celotex Co., Chicago, Ill. Tables are included to show fuel savings, when Celotex is used, in terms of gas, coal and oil. Radiation savings are shown for hot water, steam and vapor heating systems per 1000 sq. ft. of net wall and roof area, as the case may be. Sections of various wall constructions, with applications of Celotex accompany the tables, including wood siding, stucco, brick veneer and 9-in. brick. For roofs four types of construction are included —ordinary roof, Celotex under rafters or on attic floor, Celotex under rafters and on attic floor, and Ce'otex under rafters and under plaster on ceiling. Size 5½ in. x 9 ½ in.

Advantages of the International Automatic Coal Burner are given in a folder received from the Domestic Sales Corp., 150-156 Jamaica Ave., Jamaica, L. I., the company's eastern representative. Ease of installation and compact design are features emphasized by the manufacturers. All moving parts are completely enclosed. No lining or fire wall is required. The burner is designed to burn low-priced coal without smoke. Coal is fed to the burner from the hopper through a worm feed, and the ashes are removed automatically and deposited in a sealed receptacle beneath the floor. A ¼-H.P. 110-220 vo't repulsion induction type motor operates the mechanism.

Thermodine Cabinet Heater, incorporating beauty as well as efficiency, is featured in a catalog issued by the Modine Mfg. Co., Racine, Wis. In this heater, the unit heating section is placed at the bottom of a rectangular metal cabinet. Flattened copper tubes with copper fins for bracing and radiation to supply additional heating surface reach the length of the unit and connect to bronze metal tanks or headers in the ends.

Thermodine Cabinet Heater

Dimension and capacity tables for both single and double-section types are given for cabinets ranging in height from 14 in. to 44 in., in depth from 6¼ in. to 9¾ in., and in length from 17 in. to 79 in. The capacities are based on tests made by Prof. A. C. Willard at the University of Illinois.

New Swartwout Vitreous Enameled Ventilator is described in a folder from the Swartwout Co., 18511 Euclid Ave., Cleveland, O. Coated with heavy layers of vitreous enamel and embodying the same rotating principle incorporated in all Swartwout ventilators, this new model is designed particularly for use in plants where steam, smoke, gases or acid fumes of corrosive nature must be delt with. Bronze bearings and balls and lead-coated hardware parts make for troub'e-free operation. These ventilators are advocated for use in chemical plants, paper mills and dye houses.

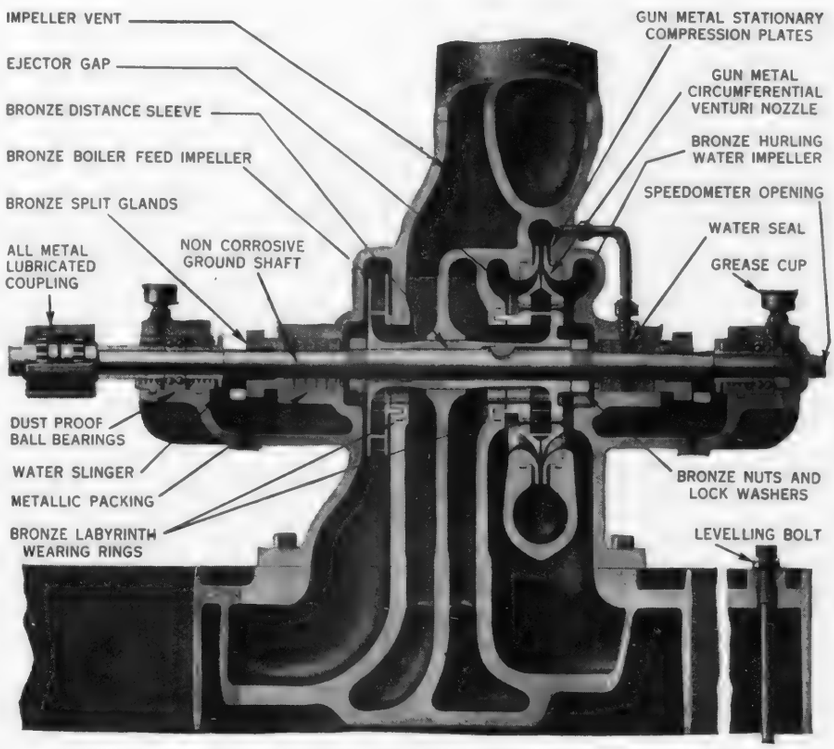
Universal Heating and Ventilating Units appears on booklet No. 210 issued by John J. Nesbitt, Inc., 11 Park Place, New York. Sectional illustrations show the internal construction of the Universal unit and arrows indicate the direction of air flow. The first series described is No. 14, which is the most extensively used. It is only 32 in. high and is manufactured in capacities ranging from 450 to 1500 C.F.M. This unit is especially designed to meet the demands of the schoolhouse architect. Descriptions of other models follow, then come details of the copper-tube radiators which are illustrated in color. Other pages present details of the motors and double-inlet a'uminum fans used in these units. Size 8¾ in. x 11¼ in. Pp. 24.

Automatic Gas Steam Radiators are featured in a handbook for agents and salesmen, issued by the Automatic Gas Steam Radiator Co., 301 Brushton Ave., Pittsburgh, Pa. The booklet describes various methods of figuring heat losses and gives information for the determination of the amount of steam radiation required. Tables for pipe sizing for the gas supply and other valuable information on the location of radiators and the operation of steam radiators are included. Dimension and capacity tables of the various types of radiators made by this company are presented in detail.

Johnston Electric-Welded Steel Heating Boilers of the coal-burning type are described in Bulletin H-200, brought out by Johnston Brothers, Inc., Ferrysburg, Mich. One feature of these boilers is the unusual shape of firebox, which has inclined sides for the purpose of increasing the absorption of radiant heat. By the use of a convex, semi-circular crown-sheet entirely clear of braces or stays, lodging places for the accumulation of dirt are eliminated. Among the illustrations in the folder is a sectional view of the boiler showing the path of the products of combustion. Products of combustion pass over a bridge-wall at the rear of the grates and into a large combustion chamber; from there they pass through tubes to the front smoke-box and then through a second set of tubes to the rear uptake or smoke connection. The separate base is of pressed-steel channel sections, welded into a single unit and having the grates installed. Smoke arch and rear curtain wall or baffle are built into place in the boiler. These boilers are readily adaptable to burning oil. Capacities range from 950 to 12,500 sq. ft. of steam radiation.

Announcing the $50,000 Bare-Back Stampede is the title of a pamphlet published by Silent Automatic Corp., 255 Meldrum Ave., Detroit, Mich., for "Silent Automatic salesmen who are interested in Gold, Glory, and Graft." Written and sketched in amusing fashion, the booklet announces a sales drive on the company's burners that will last from July 1 to October 31. Thirty-six pages of attractive premiums offer the heaviest sellers desirable additional compensation for work during the drive.

ANOTHER NAME
FOR
VACUUM HEATING PUMP PERFORMANCE
AMES

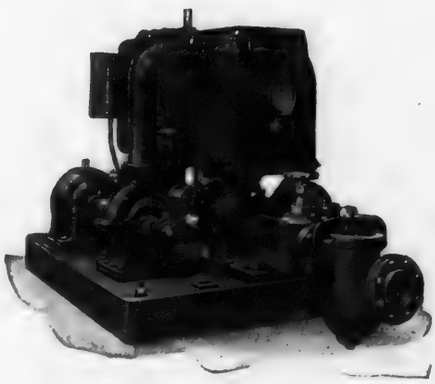


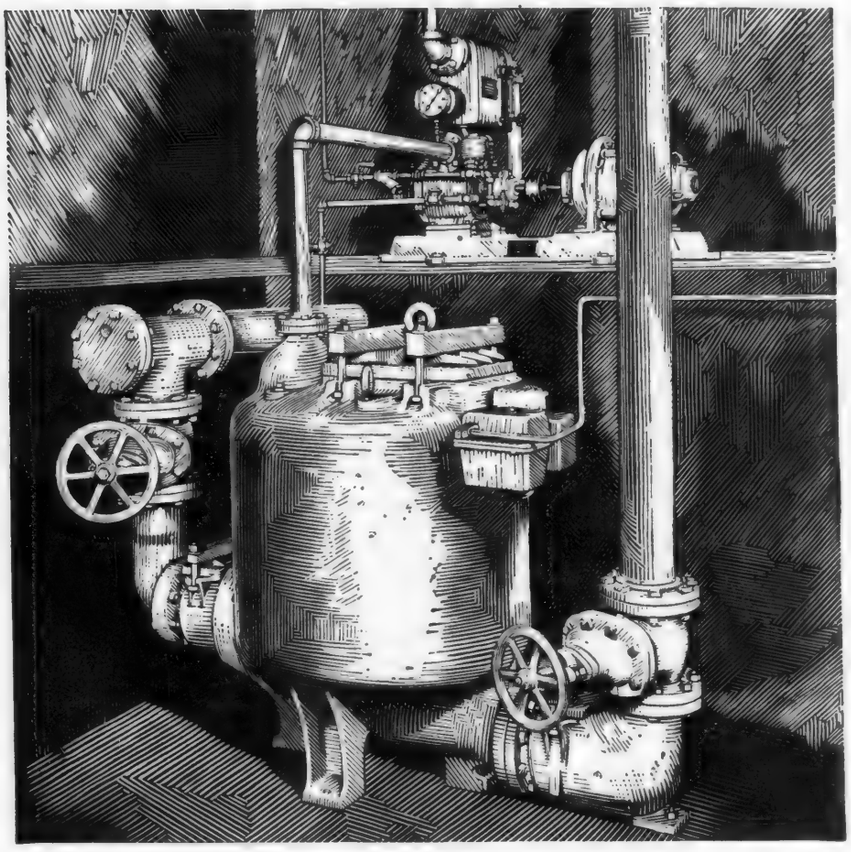
Handles Returns of 209 Degrees F. at a Corresponding Vacuum

Distinctively Different

AMES PUMP COMPANY, Inc.
30 Church Street NEW YORK CITY

Affiliated with
AMERICAN LOCOMOTIVE COMPANY





Jennings Sewage Ejectors are furnished in standard sizes with capacities ranging from 30 to 1,500 g.p.m. Heads up to 50 ft.

This sewage ejector cannot clog . . .

The Jennings Sewage Ejector readily handles unscreened sewage and drainage. Simplified in design, it operates pneumatically without employing troublesome air valves, air storage tanks or reciprocating compressors. Low pressure air is furnished by a Nash Hytor Compressor only when sewage is being moved. No working parts come in contact with the sewage. Capacity cannot be lowered—as so often happens in other type ejectors when impellers and other parts become clogged or caked with solid matter. The Jennings Ejector retains its original efficiency throughout its entire life.

For pumping unscreened sewage or drainage from basements below street sewer level; raising crude sewage from low lying districts; handling effluent, sludge and other heavy liquids the Jennings Ejector affords an efficient unit that will give years of trouble-free service at low operating cost. Write for Bulletin 67.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS—CONDENSATION PUMPS—COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES—STANDARD AND SUCTION CENTRIFUGAL PUMPS—HOUSE SERVICE PUMPS—SEWAGE EJECTORS—SUMP PUMPS—FLAT BOX PUMPS—MARINE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK, CONN.

Trade and Miscellaneous Notes

Coming Events

September 9-13, 1929. Fall meeting of the American Welding Society at Cleveland, O. Headquarters at the Hotel Statler.

October 7-10, 1929. Third National Fuels Meeting in Philadelphia, Pa. Headquarters at the Bellevue-Stratford Hotel.

October 14-18, 1929. Eleventh annual convention of the American Gas Association at Atlantic City, N. J. Headquarters at Municipal Auditorium.

December 2-6, 1929. Annual meeting of the American Society of Mechanical Engineers in New York. Headquarters at the Societies' Bldg., 29 West 39th St.

December 2-7, 1929. Eighth National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

January 27-31, 1930. Annual meeting of the American Society of Heating and Ventilating Engineers, Philadelphia, Pa. Headquarters at the Benjamin Franklin Hotel.

January 27-31, 1930. International Heating and Ventilating Exposition at Philadelphia, Pa., at the Commercial Museum.

American Radiator Buys Thomas Maddock Company

American Radiator and Standard Sanitary Corporation has acquired all the assets of The Thomas Maddock's Sons Co., Trenton, N. J., manufacturers of vitreous china sanitary ware. It is expected that American Radiator will cause the assets of Maddock to be conveyed to the Standard Sanitary Manufacturing Company, one of its operating subsidiaries. Durock plumbing fixtures, with the exception of certain assets have a book value of $489,944. For the six months ending June 30, net sales of Maddock totaled $1,353,803 against $3,263,067 for the full year of 1928. Net profit, after charges but before Federal taxes, for the first half of 1929 totaled $50,508. For the full year of 1928, net profit, after charges and Federal taxes, amounted to $170,528.

"Commercial Standards" Becomes Magazine

Commercial Standards Monthly, hitherto issued as a bulletin by the Bureau of Standards, U. S. Department of Commerce, is now published as a magazine. In its enlarged form, the magazine will cover projects of the Commercial Standardization Group which includes the Division of Building and Housing, commercial aspects of the activities of the Research and Testing Divisions of the Bureau, standardization work of other federal organizations, and, in general, more thorough coverage of the field.

Eighth Power Show Will Open December 2

Plans are well under way for the eighth National Exposition of Power and Mechanical Engineering, at Grand Central Palace, New York, opening December 2 and continuing throughout the week.

The National Power Show, as the exposition has come to be more briefly known, has become a national institution since its inception in 1922, when the attendance was only 47,589. Last year's attendance had risen to 123,000 and the number of exhibitors had made the phenomenal showing of 542 in 1928, as against only 105 in the first year of the exposition.

From a list of over 400 corporations which already have reserved space, this year's exhibits may well be grouped into three general classes: First, new developments, comprising new inventions, new processes and new ideas; second, improvements on old principles, and third, those grouped under engineering staples.

Coincident with the National Power Show, the American Society of Mechanical Engineers will hold their annual meeting in New York.

Pittsburgh Equitable Meter Company Enlarges Plant

An important expanded program has been announced by the Pittsburgh Equitable Meter Company, which will erect a new building to adjoin the present plant in Pittsburgh, so that the EMCO tin meter manufacturing facilities may be enlarged.

In 1893, this company produced the first tin meter made in this country at its East Pittsburgh plant.

In 1924, the entire plant was moved to Pittsburgh where a five-story building was erected. The new shop will be the most modern of its kind, not only in manufacturing equipment but in convenience for the employees.

Miscellaneous Notes

July building operations as reported by the F. W. Dodge Corporation, show a record July construction volume. This was the second largest monthly total on record and represented an increase of 12% over the total for July, 1928, and an increase of 20% over that for June, 1929. The total figures for the 37 states east of the Rocky Mountains were $652,436,100. Analysis of this record shows that 31% of all construction was for residential buildings, 30% for public works and utilities, 14% for commercial buildings, 10% for industrial buildings and 7% for educational buildings.

Contracts in New York State and Northern New Jersey amounted to $219,884,400, which represented the highest July total on record and the second highest monthly total ever recorded in this district. The volume on construction contracts showed an increase of over 104% over the preceding month and an increase of 60% over July, 1928. In the New England States figures amounted to $42,623,300, which was the second highest July total on record and represents an increase of 16% over July, 1928, and an increase of 20% over June, 1929.

In the Middle Atlantic States construction contracts amounted to $74,864,700. This was the highest July total on record for this district, representing a 20% increase of July of last year and 17% over the total for June, 1929. The Pittsburgh District reports contracts amounting to $65,614,300, representing an increase of 2% over the total for July of last year and an increase of 13% over the total for June of this year.

In the Central West figures amounted to $160,032,200, which showed a decrease of 21% from the total for July of last year and 15% from the total for June of this year. Contracts in the Northwest amounted to $8,855,100, showing an increase of 3% over the July, 1928, total and an increase of 1% over that for June, 1929.

Contracts in the Southeastern States amounted to $53,101,800, an increase of 1% over the total for July, 1928, and a decrease of 24% from that for June of this year. Texas reports contracts amounting to $27,460,300, which was the highest July total on record, representing an increase of 43% over the total for July of last year and 99% over the total for June, 1929.

C. A. Olson, for the past ten years refinery engineer of the industrial division of American Radiator Company has resigned his position and will confine his efforts to a study of the problems of the petroleum industry.

Manufacturers' Notes

The Sundstrand Engineering Co., Rockford, Ill., has appointed E. B. Long, formerly head of the oil-burner department of the Struble Leach Co., Youngstown, O., as district sales manager in northern Indiana and the state of Michigan. Another appointment is that of C. D. Kuck, formerly Illinois representative of the Goodyear Tire & Rubber Company as district representative in Illinois and Iowa.

Bryan Steam Corp., Peru, Ind., announces that William E. Krueger, for the past few years representing the Burnham Boiler Company, has purchased an interest in Bryan Boilers, Inc., 249 High St., Newark, N. J., which is the New Jersey State distributor of the Bryan oil and gas fired copper tube boiler. Mr. Krueger has been elected treasurer of the company as well as a director and has assumed the duties of sales manager. Erwin Kramer, formerly president and treasurer, has resigned as treasurer but continues as president and general manager of the company. Joseph O. Chrystal of Summit, N. J., continues as secretary. A sales force has been organized comprising Mr. Krueger as sales manager; William Cooper to represent the Camden-Trenton territory; E. M. Robinson, Newark and Essex county, and J. H. Werner, the New Burnswick territory. General offices will continue to operate at the Newark address.

Combustion Engineering Corp., announces the discontinuance of its New England agency representation with Schumaker-Santry Company of Boston, and the establishment of a Boston district office at 100 Arlington Street, with the following appointments in personnel: J. J. Brady, district manager, M. E. Yeager, sales engineer, and S. J. Harris, merchandise salesman. F. L. Farrell and D. F. Jones, formerly of the Schumaker-Santry Company, have become associated as Farrell & Jones, with offices at 10 High St., Boston, and have taken over the accounts formerly handled by this company.

Preferred Utilities Mfg. Co., 33 West 60th St., New York, announces that a branch office will be opened in Kenmore Square, Boston, to handle sales and engineering service for Maine, New Hampshire, Vermont, Rhode Island, Massachusetts, and Connecticut east of the Connecticut river. Harry E. Lake formerly of the New York office will be in charge of the branch. Mr. Lake is a graduate of Massachusetts Institute of Technology and has been engaged in the design and sales of oil-heating accessories for the past 15 years.

F. I. Raymond Co., 228 No. LaSalle St., Chicago, has appointed Reid Sanders of the Thermostatic Devices Company, as a distributor for the Raymond Duo-Stat in the Boston territory.

McDonnell & Miller, Wrigley Bldg., Chicago, Ill., announce that W. A. Murphy, formerly of the Hoffman Specialty Company, will be manager of the New York office at 5936 Grand Central Terminal Building.

Midwest Air Filters, Inc., Bradford, Pa., announces the removal of its New York office from 100 East 45th St., to 347 Madison Ave. E. S. Bishop is district manager of this office.

Columbia Burner Co., Toledo, O., has appointed Myron W. Wallace, formerly in the sales department, as assistant sales manager.

Draft-A-Justor Corp., 228 No. La Salle St., Chicago, Ill., has appointed M. R. Schoenfeld general manager of the corporation to succeed M. F. Cotes, who now is general manager of the Quaker Manufacturing Company.

Pittsburgh Equitable Meter Co., Pittsburgh, Pa., announces that R. V. Burnette now represents the company from the Chicago office. This appointment was made after Mr. Burnette completed the company's special salesmen's training course, which includes thorough instruction and training in different departments of the factory and offices at Pittsburgh.

S. T. Johnson Co., Oakland, Calif., has appointed the following Johnson representatives in their respective territories: Silent Automatic Oil Burner Co., York, Pa.; Arthur Schmidle, Medford, Ore.; Ponder Bros., Tacoma, Wash.; Keim & McDaries, Syracuse, N. Y.; F. A. Menth, Susanville, Calif., and H. B. McCarten, Dubuque, Ia.

Maryland Nokol Co., 1118 No. Charles St., Baltimore, Md., distributors of Johnson oil-burning equipment, announces a change in its name from The Maryland Nokol Company to The Petroleum Engineering Company.

International Combustion Tar & Chemical Corp., 200 Madison Ave., New York, announces the election of George E. Learnard as chairman of the board to succeed F. J. Lewis; Dr. Walter Runge as president to succeed W. H. Lewis, and Grant Thorn as vice-president in charge of sales. S. J. Lewis and W. H. Lewis, due to the pressure of other business activities, recently resigned. F. J. Lewis will continue as a director of International Combustion Engineering Corporation of which this corporation is a subsidiary, and W. H. Lewis will be associated with the corporation in an advisory capacity.

Chicago Pump Co., Chicago, Ill., announces a change in its representation at Fort Worth, Tex., and Portland, Ore. In Fort Worth the territory will be under the supervision of Sprekelmeyer-McDonald Co., 709 Pennsylvania Ave., and in Portland the representative will be D. R. Munro, 201 Lumbermans Building

Petroleum Heat and Power Co., Stamford, Conn., announces that the Commercial Investment Trust Corporation through its subsidiary Commercial Investment Trust, Inc., has signed an exclusive contract for financing the time sales of authorized dealers of Petro burners throughout the country. In April of this year the Petroleum Heat & Power Company absorbed the American Nokol Corporation of Chicago, and as a result of this combination the company is planning an advertising campaign calling for an expenditure of approximately $500,000.

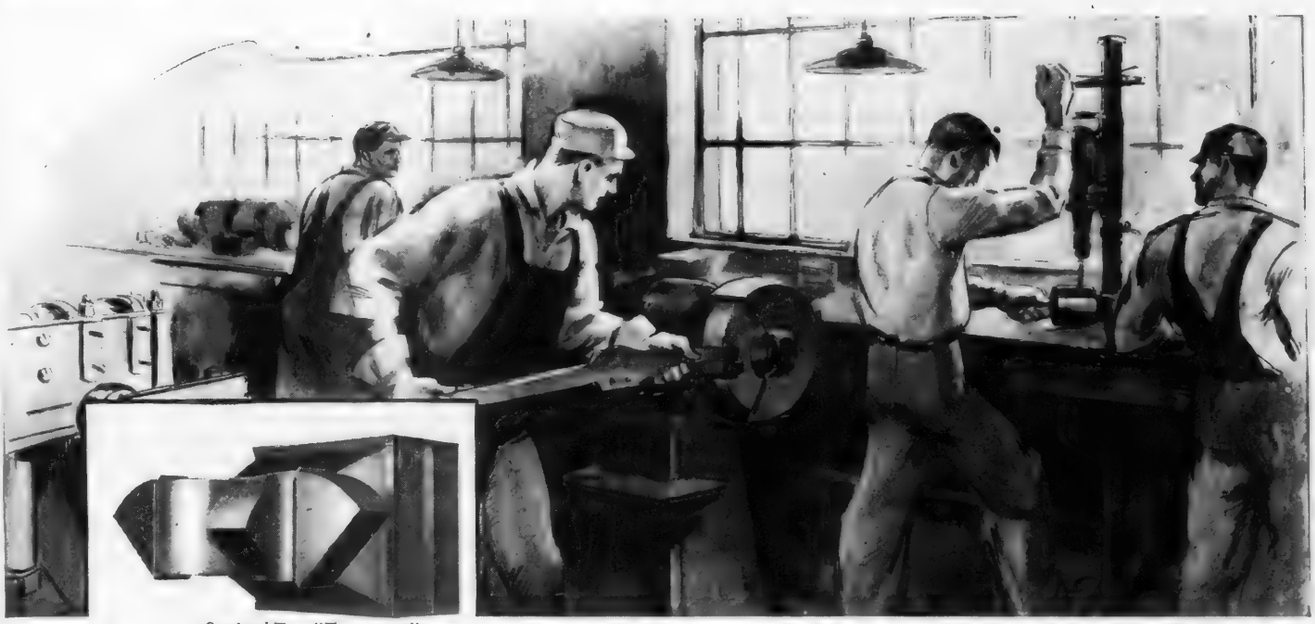
Time-O-Stat Controls Co., Elkhart, Ind., reports that its balance sheet as of July 1, shows total assets of $1,241,451 of which $807,139 are current. The balance sheet also shows a surplus of $228,781 as compared with $152,633 on January 1 of this year. Patents of the company are carried on the statement at $1. Net sales of the company for the six months ending June 30, were $724,142 or more than 66% greater than for the same period of 1928.

Wagner Electric Corp., of St. Louis, Mo., announces the transfer of F. C. Hosimer from the St. Louis home office to the Chicago branch sales office, where he will serve the company as a salesman. The company also announces its removal of the Cleveland service station and branch sales office to a new building at 3756 Carnegie Avenue.

Triad Products Co., Chicago, Ill., manufacturers of submerged coil and indirect water heaters, announces the removal of its office and factory to new quarters at 3828-42 North Kilbourn Avenue.

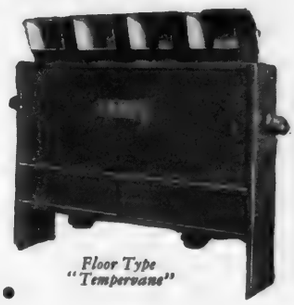
Nu-Way Oil Burner Sales Company, distributors of Nu-Way oil burners, recently opened a new sales and service room at 103 Park Ave., New York. John Taglieber is president and Charles Dittmar is secretary and treasurer. Harry Clark, factory district sales manager, also is located at this address and is devoting his time to a sales campaign at the showroom of the distributor.

Rickard Engineering Corp., Brooklyn, N. Y., recently appointed the following dealers in the eastern territory: J. H. Williamson, Newark, N. J., for the entire state of New Jersey; Charles Appleyard, Montauk Point, Long Island, N. Y.; Schoch & Abrams, Freeport, Long Island. N. Y.; Joseph T. Nagel, Nanuet, N. Y.; Albert C. Smith & Co., Inc., Poughkeepsie, N. Y., and J. Hubert Stevens, Lake Placid, N. Y.



Overhead Type "Tempervane"

"More than 5 times the heating capacity of direct radiation"...



Floor Type "Tempervane"

"Capacity" is the one essential feature demanded in any system of plant heating ..."Tempervane" Unit Heaters provide 5 times as much heat as the old, cast iron radiator systems.

Notice the plants nowadays that are heated with unit heaters...The capacity of these heaters to warm the whole plant—cold corners, too—has earned for them not merely acceptance—but *preference!*

Sturtevant manufactures two types—overhead and floor type. They may be installed without alteration to either building or steam supply. They overcome any difficult heating problems because of their flexibility and capacity.

In any of our Branch Offices you will find men anxious and competent to give you unbiased advice. Our "Tempervane" Catalog should be in your file—it is helpful and complete. Our nearest office will gladly mail you a copy.

B. F. STURTEVANT COMPANY

Plants and Offices at: Berkeley, Cal. ∽ Camden, N. J. ∽ Framingham, Mass. ∽ Galt, Ontario ∽ Hyde Park, Mass. ∽ Sturtevant, Wis.

Branch Offices at: Atlanta; Birmingham; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C.; *Canadian Offices at:* Toronto, Montreal and Galt. *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg. *Also Agents in Principal Foreign Countries.*

Sturtevant REG. U.S. PAT. OFF. *Tempervane* Heating Units

"Heat with Unit Heaters"

MORE THAN FIVE TIMES HEATING CAPACITY OF DIRECT RADIATION

Classified Advertising

Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING — 521 5th Ave., New York City.

AT YOUR SERVICE

OURS is a nationally recognized research service for the Heating and Ventilating Industry, operated in a manner to obtain the most precise results.

OUR Laboratory is completely equipped to do thorough research in all branches of heating, ventilating, air conditioning, district heating and allied problems.

WE cordially invite correspondence from manufacturers, architects and engineers. The fullest co-operation is always assured.

FROST
RESEARCH LABORATORY
Incorporated
1326 MARKLEY STREET
NORRISTOWN PENNSYLVANIA

HEATING and VENTILATING Sales Engineers with successful sales experience in fan industry wanted. Address application to Box No. 73, Heating and Ventilating.

HOUSE HEATING SALESMEN—Eastern Utility has vacancy for two men between 25 and 40 years of age for sales work in the use of Gas for House Heating. A thorough knowledge of heating and a successful sales record are essential. Permanent position with good opportunity. Please give age, education, experience and salary desired. Replies will be considered as confidential. Address Box 74, care of Heating and Ventilating.

MANUFACTURER'S AGENTS—Something new—VAPOR—VACUUM AIR VALVE. Exclusive territories available to responsible parties. State territory you desire. Address Box 75, care of Heating and Ventilating.

YOUR ATTENTION
is called to the
ENGINEERS' SPECIFICATION INDEX
on
Pages 162, 164, 166, 168

BIG BUSINESS SAYS!

"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Summer to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

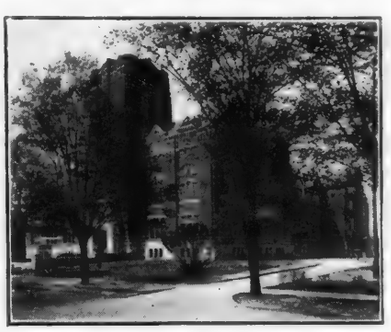
Saint Louis Technical Institute
Est. 1910.
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue St. Louis, Mo.

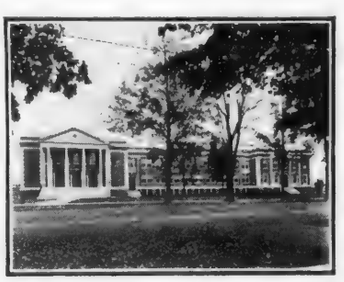
When the schools and colleges open this month the mechanical equipment must be ready for service

HOT WATER

is an important item of service.

The hundreds of school and college buildings equipped with Whitlock Service Water Heaters are ready.





When the snows of winter fly, warm comfortable buildings are sure if equipped with Whitlock Hot Water Converters.

A 'phone call to our nearest office — consult your local telephone directory under our name—will bring one of our Hot Water Engineers—who will gladly work with you.

NEW YORK PHILADELPHIA BALTIMORE LOS ANGELES BOSTON CHICAGO DETROIT SAN FRANCISCO
and other principal cities. Consult telephone book.

The Whitlock Coil Pipe Co., 130 South Street, Hartford, Conn.

INSULITE

the Wood-Fiber Insulating Board

Full ½ inch thick *Means*

12½% MORE EFFICIENT INSULATION

THAN ORDINARY 7/16" INSULATING BOARDS

TO eliminate condensation in laundries, dry cleaning plants, power plants, paper and textile mills, printing plants and similar jobs—remember that Insulite, full ½ inch thick, gives 12½% more efficient insulation than ordinary 7/16" insulating boards.

Consider what this means on ordinary jobs and how much more it means when one or two inches of insulation are specified. On a two inch job, by using Insulite, you get one-fourth of an inch more insulation than 7/16" insulating boards give.

In other words, when you want a certain thickness of insulation, and specify Insulite—you get what you order.

Insulite is made from wood fibers, chemically treated to resist moisture. It is not subject to deterioration and it has greater tensile strength than ordinary insulating boards.

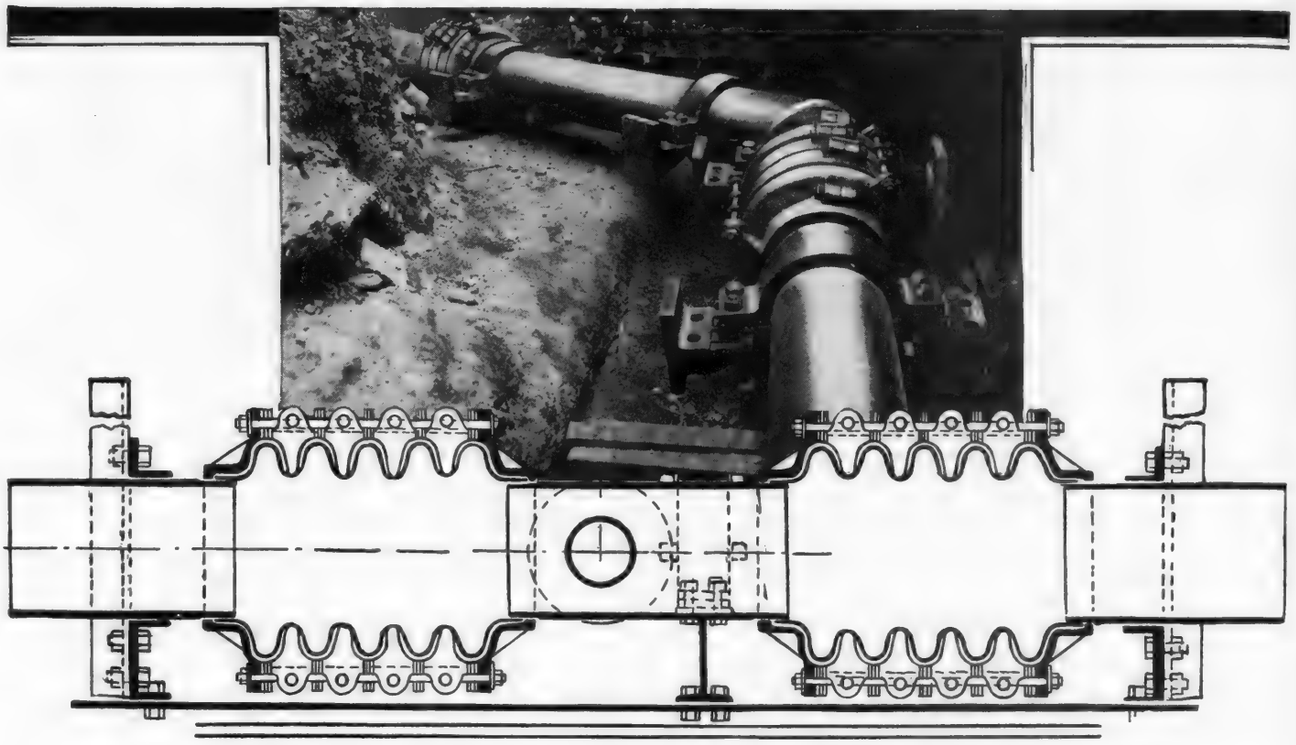
There are many advantages to be had by using Insulite. Let us send you accurate, scientific laboratory data, a sample of Insulite, and a free copy of our booklet, "Roof Insulation and the Prevention of Condensation."

THE INSULITE COMPANY
1200 Builders Exchange, Dept. 281
Minneapolis, Minnesota

Insulate with

FULL ½ INCH THICK
RESISTS
COLD-HEAT-NOISE

INSULITE
the Wood-Fiber Insulating Board



Corrugations Alone Don't Make An Expansion Joint

....It Takes "Protected" Corrugations

YOU could take any seamless tube of copper, corrugate it, insert it in a steam line and make an expansion joint out of it.

But what guarantee have you that repeated stresses will be distributed over *all* the corrugations?

This fact should be kept in mind: after a corrugation is made it has a certain point beyond which it should not be distorted. Without protection, any corrugation might easily be over-stressed.

Corrugations in Badger Joints are protected by cast iron rings. These limit the distortion, and act to distribute the movement throughout the joint.

For over ½″ expansion, Badger Joints are self-equalizing joints. They give year-in year-out service.

E. B. BADGER & SONS COMPANY

67 Pitts Street, Boston, Mass.

New York City, 271 Madison Ave.
Syracuse, N.Y., 404 S. Clinton St.
Minneapolis, Minn., 716 Build. Exch.
Charlotte, N. C., 1408 Realty Bldg.
Denver, Col., 414 W. Colfax Ave.

Chicago, Ill., 2831 South Parkway
Cleveland, Ohio, Guardian Bldg.
Cincinnati, Ohio, Union Trust Bldg.
Atlanta, Georgia, Red Rock Bldg.
Salt Lake City, Utah, Kearns Bldg.

Philadelphia, Pa., 1500 Walnut St.
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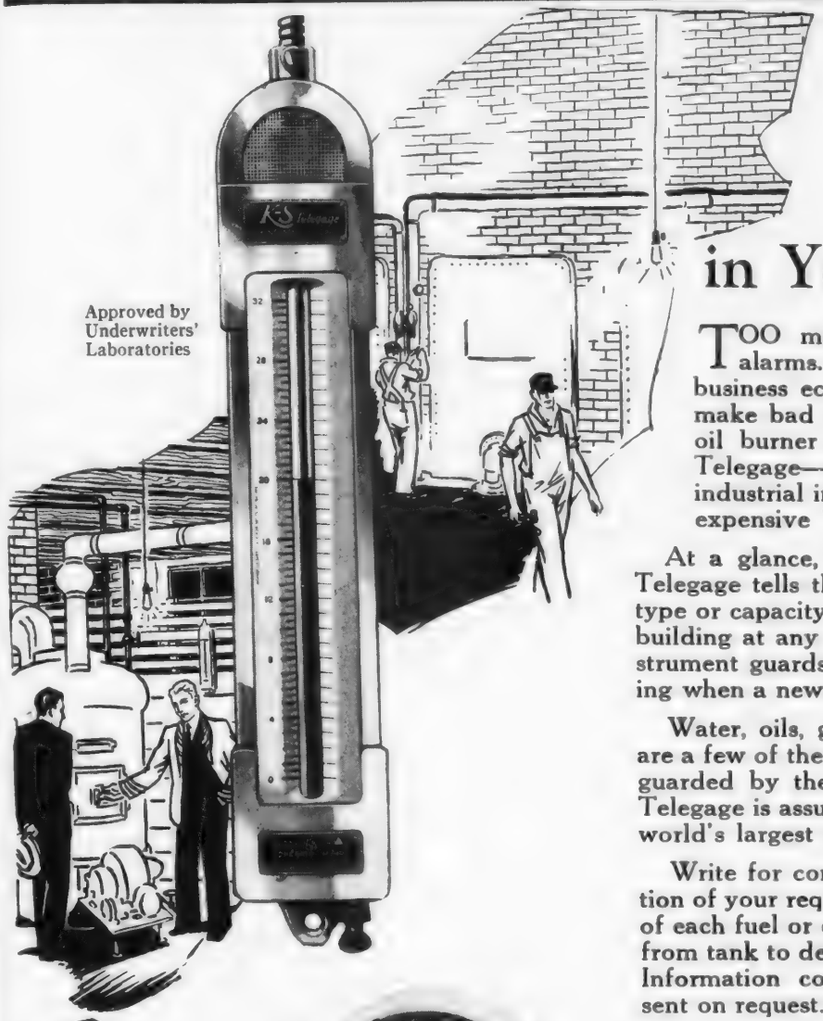
BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E.B. BADGER & SONS COMPANY · TRADE MARK

THE HYDROSTATIC DISTANT READING GAUGE



Approved by Underwriters' Laboratories

An Antidote to "False Alarms" in Your Service Work

TOO many "service calls" are merely "false alarms." Avoid them not only for the sake of business economy but also because they are apt to make bad friends and affect your sales. Tell your oil burner customers the advantages of the K-S Telegage—get it specified on every residential and industrial installation you make—and do away with expensive "false alarms."

At a glance, with ease and dependability, the K-S Telegage tells the depth of fuel in storage tanks of any type or capacity. Placed conveniently in any part of the building at any distance from the tank, this scientific instrument guards the fuel oil supply against errors, showing when a new supply is needed, and how much.

Water, oils, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant-reading gauges.

Write for complete information, giving a full description of your requirements—the Baume or Specific Gravity of each fuel or other liquid to be measured—the distance from tank to desired location of gauge—and size of tank. Information concerning our arrangement with dealers sent on request.

KING-SEELEY CORPORATION

306 Second Street ANN ARBOR, MICHIGAN

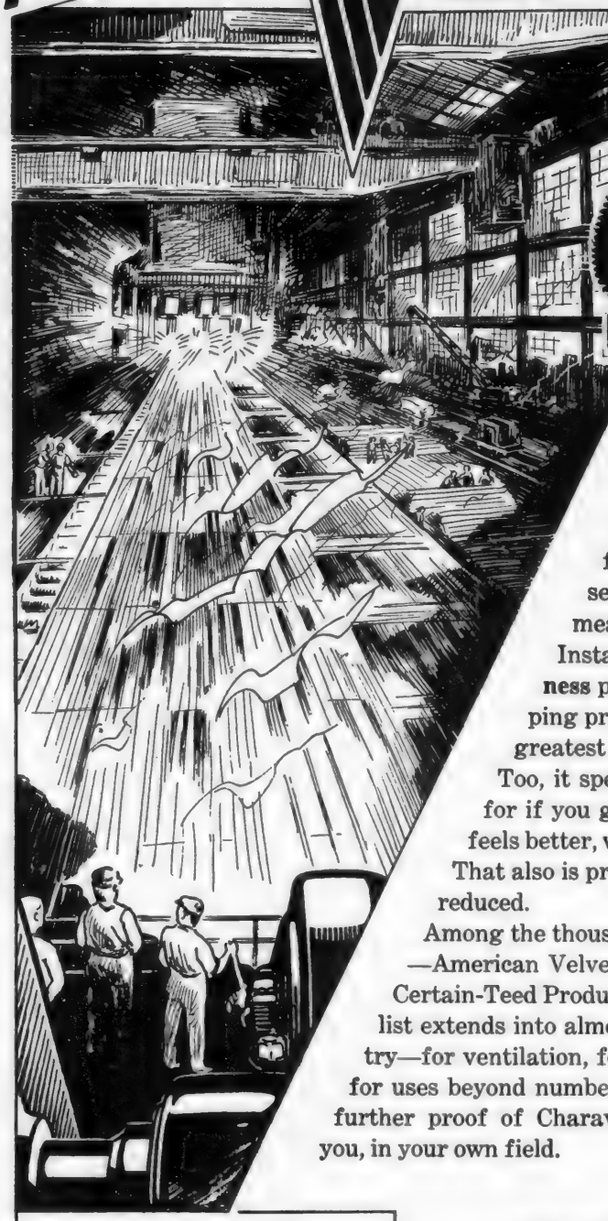
New York—44 Murray Street
Chicago—472 Wrigley Building

The K-S Telegage

BE CERTAIN WITH THE *K—S TELEGAGE*

Standard factory equipment on three-fourths of all cars selling for $700 or more.

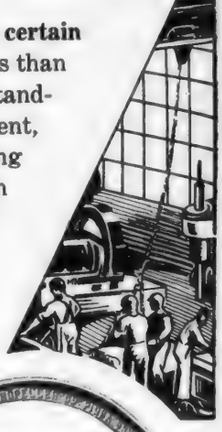
Infallible VENTILATION AT A SAVING OF 40% TO 80% WITH CHARAVAY PROPELLER TYPE FANS

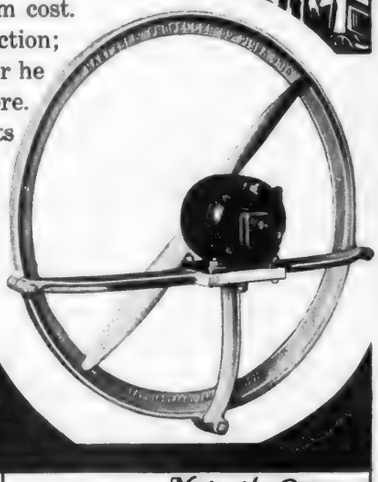


Positive, infallible ventilation . . . . **certain** circulation of air . . . . at a cost far less than you've been paying! Using the same standards by which you judge other equipment, isn't that what you expect of ventilating fans? Certainly. You want the utmost in service for the least cost. That's business. It means profit.

Installing Charavay Propeller Fans is a **business** proposition. Charavay, with its overlapping propeller blade, is designed to move the greatest volume of air at a minimum cost. Too, it speeds sluggish summer production; for if you give a man plenty of fresh air he feels better, works better and produces more. That also is profit, in addition to power costs reduced.

Among the thousands of Charavay users are —American Velvet Co., Florsheim Shoe Co., Certain-Teed Products, Heinz Pickle, and the list extends into almost every type of industry—for ventilation, for drying, for cooling, for uses beyond number. We can show you further proof of Charavay's usefulness to you, in your own field.





DISTRIBUTORS

Belanger Fan & Blower Co.
1543 Sherman St., Detroit, Mich.
Cross Ventilation Co.,
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G. S. Faries,
21 Transportation Bldg., Philadelphia, Pa
Ventilation Equipment Co.,
1601 St. Clair St., Cleveland, Ohio.
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Missouri Ventilating Equipment Co.,
3138 Olive St., St. Louis, Mo.
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Texas Fan & Blower Co.,
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J. W Thompson,
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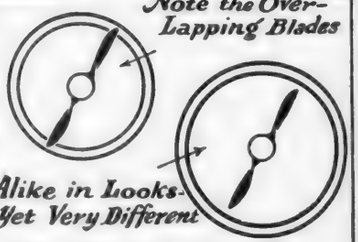
Northwestern Fan & Blower Co.,
447 Virginia St., Milwaukee, Wis.
M. P Ziegler & Co.,
1690 N. Limestone St Springfield, Ohio.

PRODUCT OF

HARTZELL PROPELLER CO.

HARTZELL PROPELLER CO.
Div. Hartzell Industries Inc.
916 Craft St., Piqua, Ohio

Note the Over-Lapping Blades



Alike in Looks-Yet Very Different

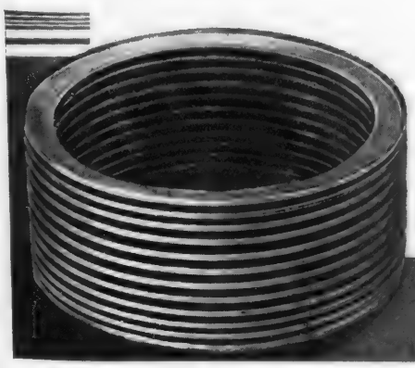
Design Number One is a Charavay Fan. Design Number Two is not and therein lies a great difference. Note that the tip of the Charavay propeller blade extends beyond the inner ring of the frame. This is a patented Charavay feature. With it Charavay displaces a much larger volume of air. Other fans with blades that do not extend past the frame produce converging air currents which impairs their efficiency.

The Right Kind to Install First

SIXTEEN years ago Sylphon Damper Regulators provided the first efficient automatic checking and increasing of drafts in proportion to steampressure or water temperature and they have never been equalled. On hundreds of thousands of heating plants they have proved their absolute superiority. They have demonstrated one of the many soundly practical applications of the famous Sylphon Bellows, the seamless, solderless diaphragm. It is the most sensitive and durable expansion member known and after years of usage shows no deterioration or change of form.

Sylphon Damper Regulator No. 23—for Low Pressure Steam Boilers

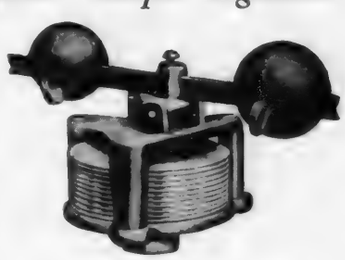
No. 23-J—for Low Pressure Steam Boilers with Light Dampers



No Servicing on Genuine Sylphon Damper Regulators

The Sylphon Damper Regulator is *standard equipment on over thirty of the nation's* leading makes of boilers, a strong testimonial to its fuel economy and its care-free performance. A study of the scientific action, and the wear proof construction of Sylphon Damper Regulators will convince you that they are the "*right kind to install first.*"

There is a reliable Sylphon Damper Regulator for every Steam, Hot Water or Vapor Heating System. We will be pleased to send you literature, fully descriptive of Sylphon Damper Regulators, their construction and installation.



No. 924—Extra Sensitive Type

Write for Bulletin HDR ——

FULTON SYLPHON CO.
KNOXVILLE, TENN., U.S.A.

Representatives in all Principal Cities in U. S. A.—European Representatives, Crosby Valve & Eng. Company, Ltd., 41-2 Foley St, London, W. 1., England—Canadian Representatives, Darling Bros., Ltd., 140 Prince St., Montreal, Que., Canada.

The Famous Sylphon Bellows

IN a few weeks the weather reports will carry such news—and homes, apartment houses, hotels, commercial buildings, schools, hospitals, and factories will be needing every b.t.u. that can be fed into the heating lines.

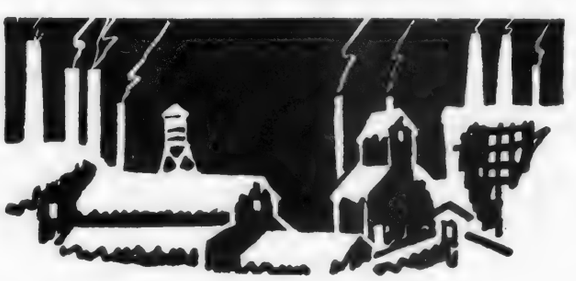
Ric-wiL Conduit is installed the year round, even during winter months when its freedom from concrete construction makes work possible. But the greatest economies will be enjoyed by those who lay their Ric-wiL insulated lines this fall, before cold weather sets in. If you are planning underground mains for use this winter, don't miss the good installation weather.

Recent operating tests of Ric-wiL indicate a highly profitable efficiency; line losses have been averaging from 6% to 8%. Ric-wiL compact rugged design, the effective base drain foundation, water-tight conduit because of the Loc-liP Joint, and Dry-paC (waterproof) insulation—these in fully closed construction guarantee economical delivery of steam no matter what the thermometer says.

Mid-winter installation of Ric-wiL Conduit, successful because no concrete construction is needed. But you'll escape winter difficulties if work is completed before freezing.

Type F Ric-wiL Conduit insulated with Dry-paC (waterproof) filler.

Prompt service and enthusiastic cooperation. Be sure to get Ric-wiL bids on your work



The Ric-wiL Company

1567 Union Trust Bldg., Cleveland, Ohio

New York Baltimore Atlanta Chicago

Originators *of* Waterproof Conduit Filler

UNDERGROUND CONDUIT

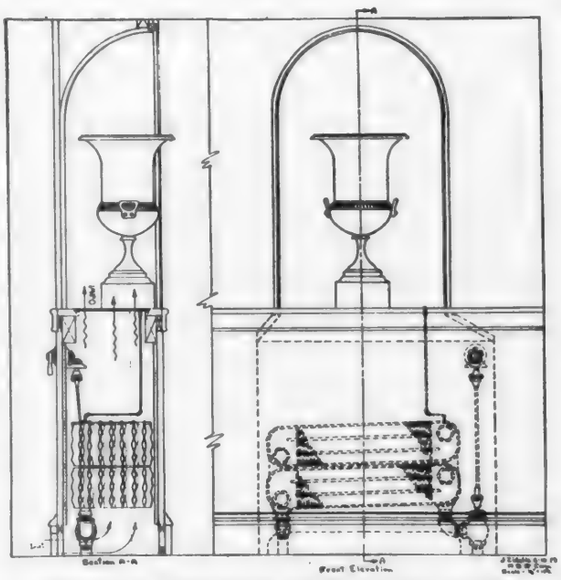
Grilles in the floor of niches admit heat from Robras 20-20 radiators in the house of C. H. Mattheison, Jr., Center Island, L. I. Hines Brothers, Great Neck, L. I., Heating Contractor

Can ROBRAS 20-20 Radiators Be Used Without Grilles In The Face Of The Wall?

There are several ways in which Robras 20-20's can be used without grilles in the face of the wall. One way is to use Robras 20-20's as direct-indirect radiators with floor grilles. The light weight of these radiators permits an installation of this sort without great expense.

Pictured above is another way of meeting the problem. It requires, of course, that the wall be designed for such an installation. Here the outlet grilles are installed in the floor of each of the niches.

When desired to get the full efficiency of the Robras 20-20 radiators the urns can be removed to give a fuller opening for the passage of the warm air. Cold air finds its way to each radiator through the floor opening on the reverse side of the wall.



Method of installation showing inner opening by reverse wall.

The light weight of these radiators makes installation much less expensive and therefore there is a greater profit in installing them. Their small size and adaptability make the finished job more satisfactory to your customer, who wants the radiators out-of-sight and out-of-the-way.

We have price lists and data sheets ready to send you if you will please send us your name.

ROME BRASS RADIATOR
CORPORATION
ONE EAST FORTY-SECOND STREET ℘ NEW YORK CITY

Stop the Racket! Isolate Machines with Cork

THE most practicable, sure and economical way to reduce noise of vibrating motors, fans and pumps is to *isolate the machine.*

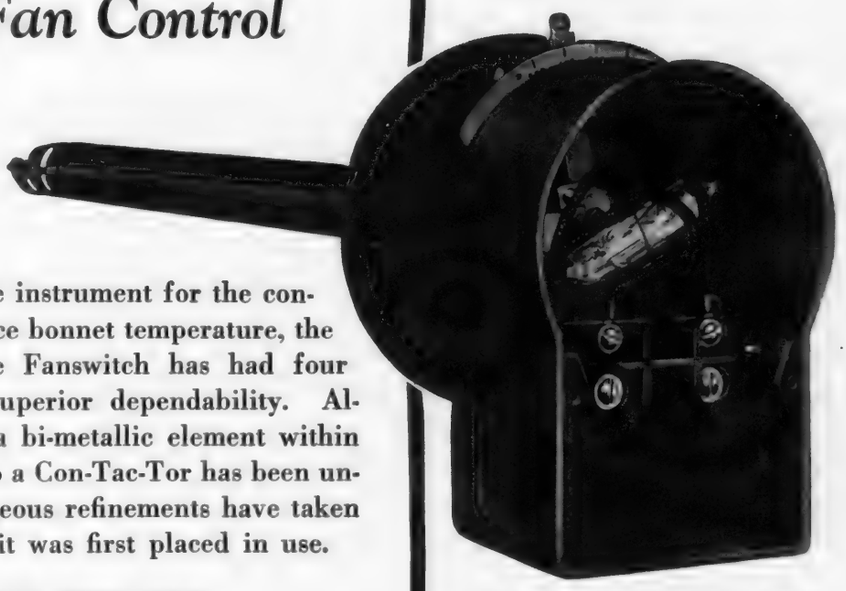
Armstrong's Cork Machinery Isolation between the machine and its foundation absorbs vibration and prevents its transmission to the building structure. Armstrong's Cork Machinery Isolation will not pack down and harden but will retain its original resilience permanently. Moreover, Armstrong's Cork Machinery Isolation is manufactured under conditions which assure uniform density throughout—an important consideration in the selection of cushioning material.

Armstrong engineers will be glad to study your vibration problems and help you with the solution. Armstrong Cork & Insulation Company, 925 Concord Street, Lancaster, Pa.; McGill Bldg., Montreal; 11 Brant Street, Toronto.

Armstrong's
Ⓐ *Cork* MACHINERY
EVERY BOARD TRADEMARKED
ISOLATION

The Furnace Fanswitch

for Booster Fan Control



This is the Time-O-Stat No. 68R Furnace Fanswitch. Its mercury Con-Tac-Tor handles the motor load directly. Write for diagrams and literature showing the complete use of this control.

AS the original mercury tube instrument for the control of motors from furnace bonnet temperature, the Time-O-Stat No. 68R Furnace Fanswitch has had four heating seasons to prove its superior dependability. Although the basic principle of a bi-metallic element within the bonnet directly connected to a Con-Tac-Tor has been unchanged, a number of advantageous refinements have taken place in this instrument since it was first placed in use.

CONTROLS MOTORS DIRECTLY

The No. 68R is connected in series with the fan motor and handles this load at line voltage without the necessity for relays of any kind. The capacity of its Con-Tac-Tor is ample for any domestic fan load. Installation is extremely simple not only as regards the wiring but the mounting of the instrument itself. It is attached to the furnace bonnet into which the stem projects and is leveled by an ingeniously mounted collar.

FUNCTIONS ON BONNET TEMPERATURES

The Furnace Fanswitch controls the fan motor according to bonnet temperatures. When the air in the bonnet is sufficiently warm, the fan starts automatically; the fan cannot run when there is no warm air to be circulated. This makes for greatest efficiency and at the same time relieves the owner of the necessity for constant attention, the Furnace Fanswitch operating as the need arises.

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

Successor to

Absolute Con-Tac-Tor Corporation
Leachwood Company Time-O-Stat Corporation
Cramblet Engineering Corporation

The ultimate achievement in SIMPLIFIED HOME HEATING with BARBER Automatic JET GAS BURNERS

Manufactured and Patented by
The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

No. 300-R

• • BARBER • •

PATENTED

AUTOMATIC GAS BURNER

Manufactured by

The CLEVELAND GAS BURNER & APPLIANCE Co.

Cleveland, Ohio

This Book Tells the Story of Gas Conversion for You

It's all you need to add hundreds of dollars in profit to your books every year. It tells you the new, simplified story of gas conversion as Barber Automatic Jet Gas Burners have written it for hundreds of plumbers all over the country.

It illustrates the complete line of Barber Automatic Jet Gas Burners and tells you how to use Barber Burner Specification Data Sheets.

These data sheets have taken all the "kick-back" out of selling gas conversion burners. There is nothing left for your customer or prospect to question; nothing for you to worry or wonder about.

There is not a house-heating furnace or boiler doing duty today but can be converted to use gas.

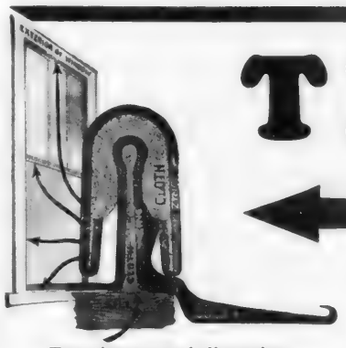
Now, you can sell gas heat—the heat that everybody wants—at a price that is within the reach of every home in your community and in a manner that takes all of the guesswork, all of the extra labor and sales effort out of your hands.

Write us without delay for Catalog 29-A and our new prices.

The CLEVELAND GAS BURNER & APPLIANCE CO.

Burner Specialists

3702-04 Superior Avenue, Cleveland, Ohio



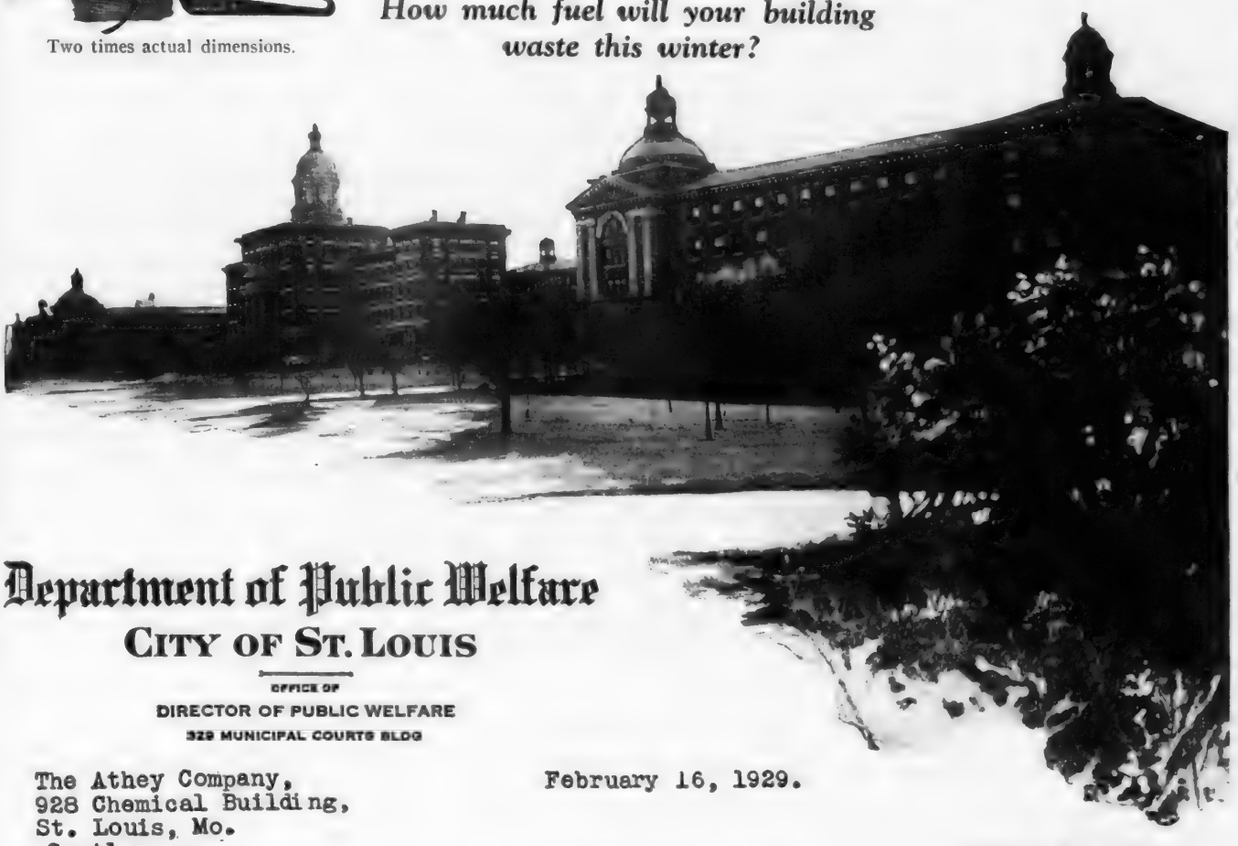
Two times actual dimensions.

This

Eliminated a 350 H. P. Boiler Saving $1500 a month in fuel

and cancelled an order for $2000 worth of blankets.

How much fuel will your building waste this winter?



Department of Public Welfare
CITY OF ST. LOUIS

OFFICE OF
DIRECTOR OF PUBLIC WELFARE
329 MUNICIPAL COURTS BLDG

The Athey Company,
928 Chemical Building,
St. Louis, Mo.

February 16, 1929.

Gentlemen:--

You will perhaps be glad to know that through the weather-stripping job handled by your people at the City Sanitarium recently, we were able to discontinue the use of one 350 horse-power boiler, a saving to the City of about $1500.00 a month in coal. We were also able to cancel an order for about $2000.00 worth of blankets, which had been requisitioned for use during the present winter.

Feeling that this information would be of interest to you, we gladly submit it.

Yours very truly,

H. L. Dalesburg

Director of Public Welfare.

Send for this book today

It will help you cut down heating expenses

Athey Weatherstrips Pay for Themselves in a Short Time

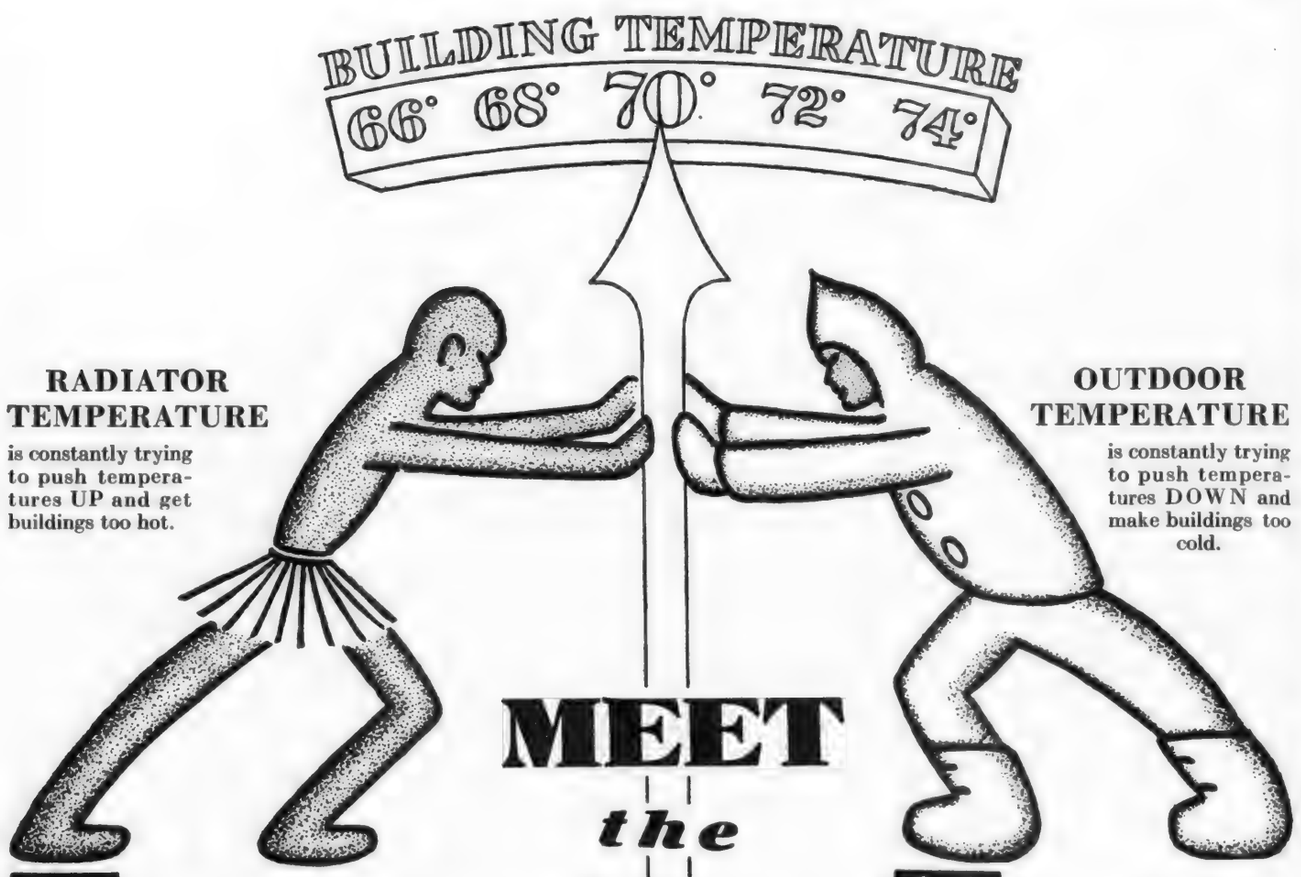
ATHEY COMPANY

6097 West 65th Street Chicago, Illinois

Representatives in Principal Cities

In Canada: CRESSWELL-POMEROY, *Reg'd,* Montreal - Toronto

WEATHERSTRIPPED BY Athey



RADIATOR TEMPERATURE
is constantly trying to push temperatures UP and get buildings too hot.

OUTDOOR TEMPERATURE
is constantly trying to push temperatures DOWN and make buildings too cold.

MEET *the* Temperature Twins

Here they are—RADIATOR TEMPERATURE and OUTDOOR TEMPERATURE. Between them they control the temperature of every building.

OUTDOOR TEMPERATURE is an unruly fellow. He can't be controlled. Some days he blows and pushes for all he's worth. Other days he's mild. You can't do anything with him.

But his twin—RADIATOR TEMPERATURE—is as docile as a lamb, **if he is properly controlled.**

With a Raymond Duo-Stat you can control Radiator Temperature so perfectly that—no matter what Outdoor Temperature does—he will push just hard enough to keep the building at the temperature you wish.

Here, at last, is a heat control system which does the one thing that other systems can't do. **It balances the heat supply with the heat losses,** so that every radiator on the entire line is kept supplied with the exact amount of heat needed to keep the building at a constant temperature.

THE RAYMOND DUO-STAT

consists of two temperature bulbs, one outdoors and the other attached to the last radiator on the line, both acting on the same mercury switch.

Any temperature changes (either outdoors or in the radiator) immediately act upon the Duo-Stat which "speeds up" or "slows down" the boiler so that the radiators get the exact amount of heat needed.

Simple to Install— Low in Cost

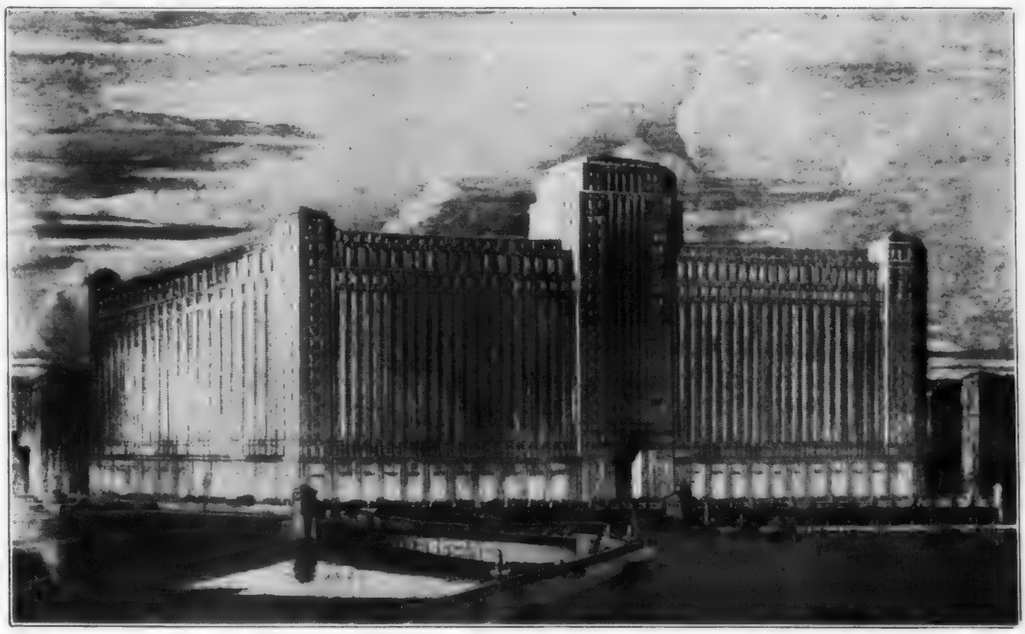
As simple to install as a room thermostat. It is practical for any building, large or small, old or new. And reduces the cost of completely automatic heat to a point where anyone can use it.

Write

The Raymond Duo-Stat has been installed in buildings of every size and kind. Invariably it has bettered heating conditions and saved a lot of fuel. Let us supply you with more definite facts.

F. I. Raymond Co.

BUILDERS BUILDING
228 N. LA SALLE STREET **Chicago**



MERCHANDISE MART, 215 West Wacker Drive, Chicago, Ill.

GRAHAM, ANDERSON, PROBST & WHITE
Architects

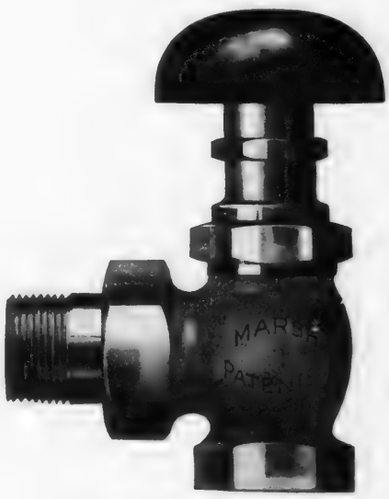
JOHN GRIFFITHS & SON CO.
General Contractor

FREDERICK J. PEARSON
Consulting Engineer

ROBERT GORDON, INC.
Heating Contractor

MARSH CONE DISC PACKLESS VALVES

used throughout on this job



Cone Disc Packless
Fig. 141

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

General Sale Distributors

Edward T. Hetherington
1709 Sansom St., Philadelphia

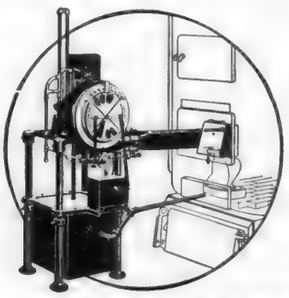
Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs
431 So. Dearborn St., Chicago, Ill.

UNITED STATES RADIATOR CORP'N
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
Canadian Agents Guelph, Ont.



McILVAINE OIL BURNER
Listed by Underwriters

Continuous Flame Dependable Heat

No Gas Pilot · · No Electric Ignition
Graduated Automatic Control
Mechanical Draft

Distributors—Write for the McIlvaine Sales Plan

McILVAINE BURNER CORPORATION
Dept. H · 745 Custer Ave. · Evanston, Ill.

New De Bothezat Bifurcator

For special ventilating jobs where fumes of excessive temperature or corrosive character are to be removed. The bifurcator is a device that permits the use of a *straightway duct*. It eliminates right angle bends and long shaft connections, at the same time protecting and automatically cooling the motor. A *short shaft* connects the fan to the motor, which is located in a transverse opening through the duct. The fan chamber is *stream lined in* section, and the *bifurcated duct is not reduced in area at this point. Full details on request.*

DE BOTHEZAT BIFURCATOR

The new ventilating device securing the perfect protection of the motor from:

dust, acid fumes, hot, smudgy, greasy air.

No extended shaft used nor bending of ducts necessary.

Simple, Highly Efficient, Trouble Proof
—Yet Inexpensive—

You cannot find a more compact and powerful device than the De Bothezat Bifurcator used in conjunction with the *De Bothezat Disc Pressure Fan,* well known for its *high efficiency, high static pressure* and *non-overloading power characteristics.*

DE BOTHEZAT IMPELLER CO., Inc., 1922 Park Avenue, New York, N.Y.

SIMPLICITY
that will satisfy you with the ease of INSTALLATION

DEPENDABILITY
that will satisfy your customer with its OPERATION

GORTON
SINGLE PIPE VAPOR SYSTEM

SIMPLEST OF ALL VAPOR SYSTEMS

WE CORDIALLY INVITE YOU TO SEND FOR FULL DETAILS

GORTON HEATING CORPORATION

Manufacturers—Established 1887 96 Liberty St., New York City

Why not hide the radiators too?

(by eliminating them entirely)

You wouldn't think of installing water and gas pipes, drains and conduits in a modern building where they would be exposed to view—and it isn't necessary to have unsightly, inefficient radiators cluttering up rooms either. Trane Concealed Heating has made radiators unnecessary and obsolete in any room — at the same time providing greater heating comfort with less fuel consumption—and at a cost no greater than that of cast iron radiation, equipped with high grade covers.

The Trane Concealed Heater is an engineered job from the patented, copper heating elements to the inconspicuous grilles. The grilles are the only visible parts. All other parts, including the adjustable steel stack, piping and fittings, are hidden between the walls. Units are complete, ready to be installed —there is no fussing on the job.

When the job is finished, there is nothing to mar the decorative scheme of the room, and you have a system which provides instantaneous control of heat—and is designed to give maximum heating comfort.

To finish the job in truly modern fashion, connect Trane Concealed Heating with a Trane Vapor System, long accepted as standard in the better class of homes. Trane Packless Bellows Valves, Traps and other heating specialties are manufactured according to one standard of quality—the highest.

Send for the new 24-page book, "Modern Style in Room Heating"—no obligation.

THE TRANE COMPANY, Dept. 9
206 Cameron Avenue, La Crosse, Wis.

Heat With Unit Heaters

HEAT CABINETS **TRANE** CONCEALED HEATERS

PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

The Final Chapter in the History of Heating

5,000,000 Cubic Feet

of space heated — without a smokestack and no floor space used

NO Boiler Room, Boilers, Coal Storage, Stokers, Radiators, Ashes, Grit or Dirt, Smoke or Soot, or Licensed Firemen

100% Automatic Control with "STERLING"

DIRECT GAS-FIRED Unit Heaters

With a considerable saving in first cost, operation and maintenance over all other methods of heating. They deliver the heat where you want it, — when you want it without waste or worry, and no firemen or engineers are necessary.

Take the time to investigate! Facts will convince you. Write, telephone, or call.

TEXO SALES COMPANY, Inc.
Originators of the Gas-fired Unit Heater
MANUFACTURERS
Heating and Ventilating Equipment
CINCINNATI, OHIO

Below:—The John Van Range Company, Cincinnati, the largest Gas Heating Plant in the World. 54 Sterling Units Used.

MASTER HEAT REGULATOR

Full Electric Motor

A Precision Instrument
with New, Better Features

THIS regulator gives closer, more accurate regulation with unfailing reliability in operation.

Its exclusive *gradual operation* insures the greatest possible uniformity of temperature.

Thermostat shows position of valves or dampers at all times, thus indicating to the user the condition of the fire. Plain or clock models.

Used with coal, gas or oil in steam, hot water, warm air or combination plants.

Get all the facts. Write for full information.

W-M-C Water Thermostats

For hot water heating systems—accurate, dependable, inexpensive. Installed without draining boiler or stopping fire. *Write for details today!*

White Mfg. Co.

2362 University Ave. St. Paul, Minn.

Oldest New York Bank Selects Oldest Manufacturers to Supply Hot Water Heaters

The Bank of New York & Trust Co.—the oldest bank in New York State—chose Patterson Heaters to furnish hot water for their new 32-story home.

With an experience of 145 years back of them, the officials of this bank know that age is a safeguard in judging the reliability of a manufacturer. For no manufacturer can stay in business over a long period of years unless his products give entire satisfaction. Consequently Patterson Hot Water Heaters, which are made by the country's oldest heater manufacturers, were installed.

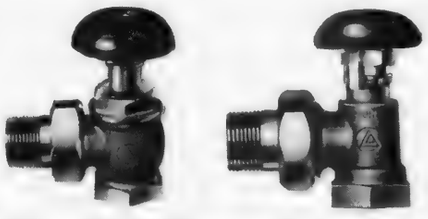
When you want to be sure of getting all the hot water required, as hot as required and as quickly as required, you will find it safe to follow the example of this conservative old institution and specify the "Patterson."

May we send you our catalog?

The Patterson-Kelley Co.
107 East 40th St., New York, N. Y.

Patterson
Hot Water Heaters

Why *have so many* CONTRACTORS *standardized on* ARCO PACKLESS VALVES?



No. 999 Steam

No. 901 Water

OWNER satisfaction is necessary for your success. How can your customers be satisfied with the job if every year or so valves leak and have to be repacked? Why not give your customers the satisfaction of Arco Packless valves? They never need repacking and they are leak-proof. Owners will gladly pay the few cents extra cost for the protection of these quality valves. They will take Arco Packless every time when you explain how in the long run these valves actually cost less than the cheapest packed valve made.

The latest addition to the complete line of Arco Packless valves is the already famous 901 Hot Water Valve. The 901 is the only valve on the market that combines these three vital and exclusive features all in one valve.

PACKLESS—does away with the expense and trouble of repacking—complete protection against leaks.

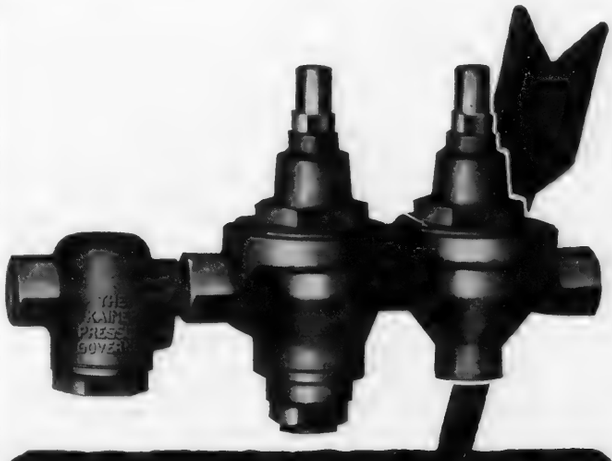
SWINGING PLATE—So designed that it acts as a cleaning tool—impossible for the valve to stick.

EQUALIZING FEATURE—Adjustable stop with indicator makes it possible to balance the job after installation and then set permanently, maintaining a perfect equalization of flow regardless of pipe sizes.

If you are not using Arco Packless Valves it will pay you to investigate this broad line of low-priced quality valves.

AMERICAN RADIATOR COMPANY

Makers of a complete line of VALVES, VENTS *and* REGULATORS



The KAINER PRESSURE GOVERNOR

for Hot Water Heating Systems

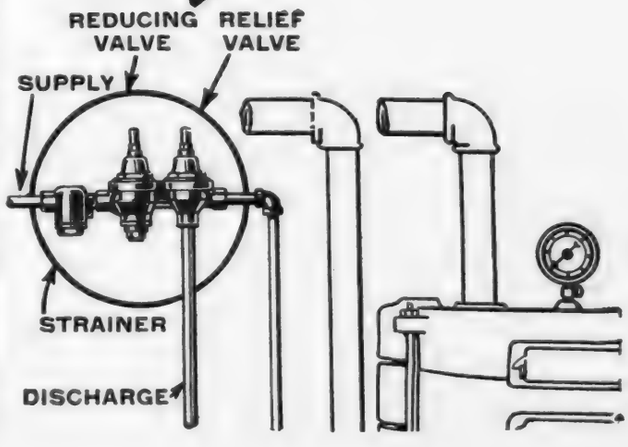
More and more plumbing and heating contractors and engineers are recommending and installing the KAINER Pressure Governor in place of expansion tanks and fittings on their hot water layouts.

The overwhelming nationwide acceptance of the KAINER during the past few years affords ample proof of the sound engineering principles that characterize the design and construction of this dependable Governor.

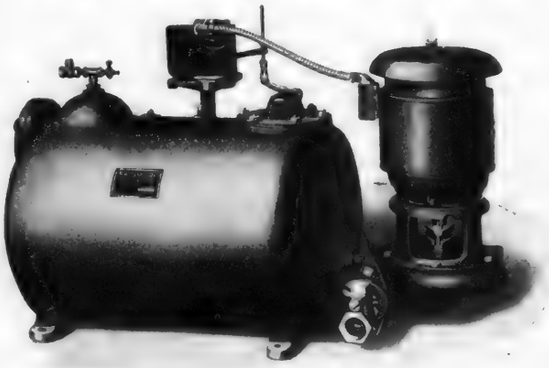
The KAINER Governor reduces the cost of a hot water layout, simplifies installations, makes a better job, saves your time and your customer's money, increases your profits and builds good will.

Write today for full information

KAINER & COMPANY
CHICAGO
761-771 MATHER STREET
Manufacturers

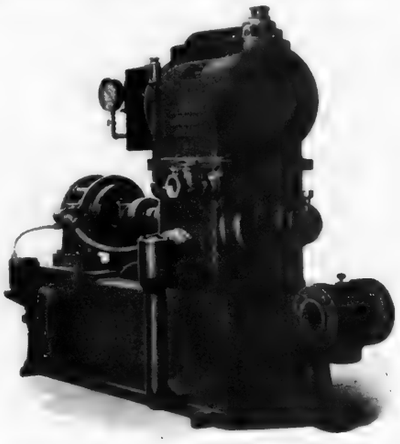


Low Water Line Control



THE Skidmore Condensation Pump is furnished in all sizes with cast iron receivers of large water capacity, the motor being supported on a rigid cast iron volute bolted to the end of the receiver. A float switch is mounted on top of receiver and connected to motor with flexible conduit.

The centrifugal impeller is of bronze enclosed type and is locked on the end of the shaft against bronze sleeve which extends through the stuffing box over the extended shaft of the motor, which is of ball bearing type, of ample capacity and standard make. *Bulletin No. 7 gives you full details.*



Low water line control without pitting is made possible with The Skidmore Vacuum Pump on interceptor base.

The unit is self-contained, ball bearing and operated by one motor. It produces vacuum on the system even when operating on float control.

Two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed, comprise the unit. Compactness and minimum floor space requirements are assured through the mounting of both motor and pump on interceptor base.

Ask for Bulletin No. 6 for full details of Skidmore Vacuum Pumps

SKIDMORE CORPORATION

General Offices and Factory: 1535 Dayton Street, Chicago

REPRESENTATIVES IN PRINCIPAL CITIES

Canadian Representatives: Darling Bros., Ltd., 120 Prince St., Montreal

THERMO SYPHON TRAP

IF YOUR HEART STOPPED

YOU WOULD BE NO MORE DEAD THAN A HEATING SYSTEM EQUIPPED WITH AN UNCERTAIN TRAP . . . .

THERMO SYPHON TRAPS ARE POSITIVE

a trap that fails to deliver positive service in action is worse than no trap at all.

KEEPING WATER LEVELS UP TO THE SAFETY LINE IS AS ESSENTIAL TO A BOILER'S LIFE AS CHECKING HARDENING OF THE ARTERIES IN THE HUMAN SYSTEM IS TO THE LIFE OF MAN.

Send for Bulletin No. 16-HV giving full details.

We solicit your correspondence on heating difficulties.

THERMO SYPHON TRAPS ADD TO THE LIFE OF ANY BOILER

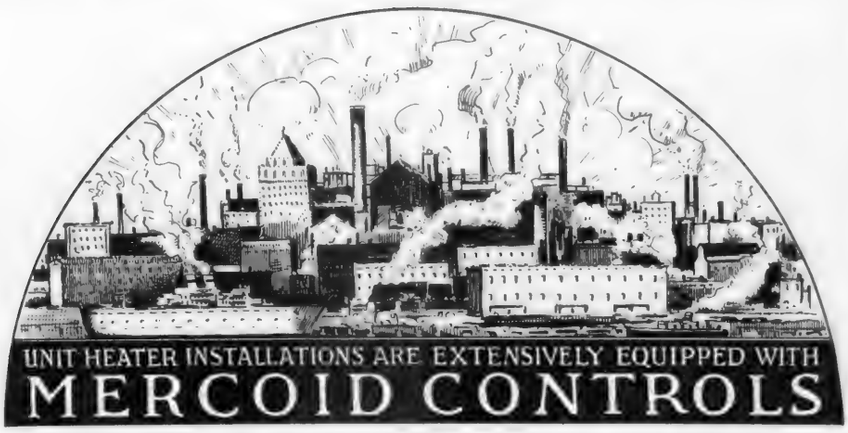
Thermo Syphon Traps may be used with success on the various prominent patented vapor, vacuum, atmospheric and modulation systems. They will put new life in old heating systems.

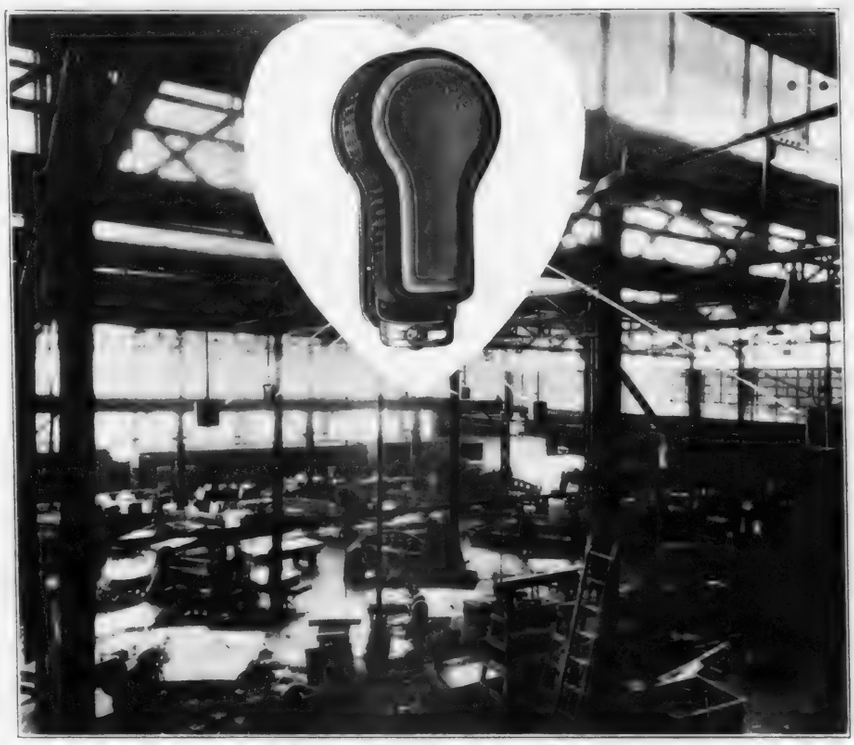
Thermo Syphon Traps are especially designed to handle condensation from any type of one or two pipe steam heating systems with a vacuum or pressure not exceeding 20 pounds boiler pressure.

THERMO SYPHON

LYTTON MANUFACTURING CORPORATION

FRANKLIN, VIRGINIA





A Modine Unit Heater Installation

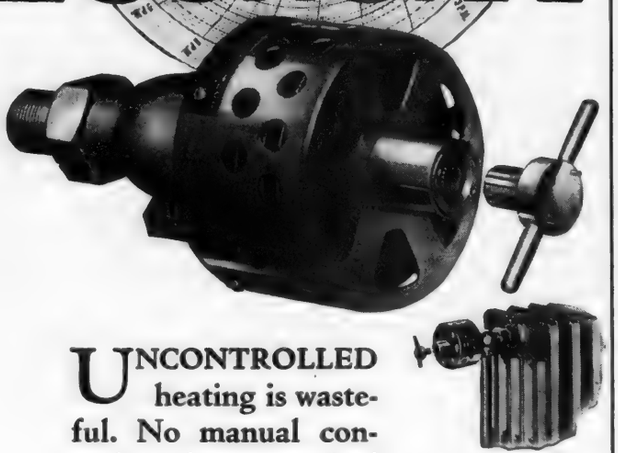
THE HEART

—of a unit heater is the control that regulates it. Properly controlled unit heaters represent the greatest efficiency. Mercoid Controls are widely used on unit heater installations. They are accurate and dependable and insure perfect satisfaction. Their unfailing performance means a saving in service expense to the installer, a saving of fuel to the customer, and a saving of annoyance to the workman. Predetermined temperatures, uniformly prevail, wherever Mercoid Controls are used. Our engineering department will assist in determining the correct application of Mercoid Controls for all types of unit heaters. Mercoid Thermostat Figure 21 is commonly used. Figure 21LD is the same as Figure 21 excepting that it has the locking device, to prevent tampering.

THE MERCOID CORPORATION
564 WEST ADAMS STREET
Chicago, Illinois, U. S. A.
New York Office: 25 Church Street, New York, N. Y.

CONTROLS
MERCOID

CONTROLLED TEMPERATURES MEAN HEATING ECONOMY



UNCONTROLLED heating is wasteful. No manual control can be economical —or healthful—because of the unavoidable wide temperature fluctuations.

The Thermotrol—which regulates room temperatures through regulation of individual radiators — will accomplish fuel economies that are almost unbelievable because it eliminates wasteful heating.

The Thermotrol is simple to install, accurate in its functioning, inexpensive to buy and maintain and it will save 1/3 to 1/2 of the fuel bill.

It pays for itself out of savings.

Ask us for complete information.

STERLING ENGINEERING CO.
1644 Holton Street Milwaukee, Wis.

Representatives in principal cities

The Thermotrol

A Turn of the Switch Regulates Speed and Heat

A TURN of the switch on the Baldor Controller Box regulates the Variable Speed Baldor Motor to 40%, 60%, 80% or maximum speed, which in turn regulates the heat from unit heaters. Get the facts on this new motor that is revolutionizing the unit heater industry. . . .
BALDOR MOTOR COMPANY,
4356 Duncan Ave., St. Louis, Mo.

BALDOR
A BETTER MOTOR

49 Young Unit Heaters

replaced the pipe coil radiation and effected a substantial saving in fuel consumption for the Four Wheel Drive Truck Co., Clintonville, Wis. During the past severe winter, with outside temperatures ranging as low as 32 degrees below zero, Young Unit Heaters maintained a more comfortable and even temperature, at lower operating cost, than had been possible with the previous heating system under normal winter conditions.

Get the facts about Young Unit Heaters
— ask for Bulletin H-429

Plant of Four Wheel Drive Truck Co., Clintonville, Wisconsin

YOUNG
RADIATOR COMPANY
Heating Division
RACINE WISCONSIN
Representatives in Principal Cities
Correspondence Invited on Open Territories

Young Quality
Reg. U. S. Pat. Off.
© Y. R. Co.

Built for Endurance and Maximum Performance

. . . Since 1883 a Period of 46 Years, Bayley Air Equipment Has Steadily Found Favor with Executives and Engineers. We Can Think of Nothing more Convincing in the Way of Evidence of Sound Design and Construction.

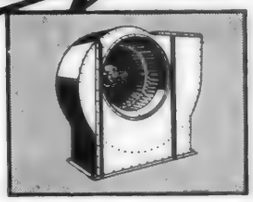
Is Your Bayley Library Complete? These valuable reference books will be mailed you on request:

Catalog No. 26— Plexiform Fans
Catalog No. 30— Chinook Heaters
Catalog No. 25— Turbo Air Washers
Catalog No. 32— Aerovane Blowers
Catalog No. H1— Unit Heaters
Catalog No. R1— Induced Draft
Catalog No. B— Exhaust Fans
Catalog No. LD— Leather Dryers

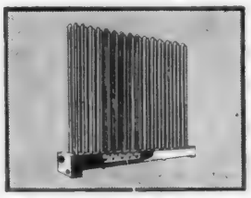
BAYLEY BLOWER COMPANY,
742 GREENBUSH ST., MILWAUKEE, WIS.
Representatives in Principal Cities

Bayley
Established 1883

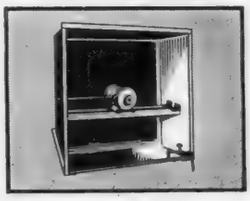
FANS



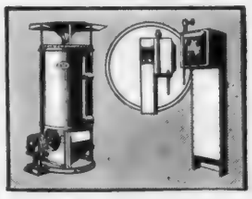
HEATERS



AIR WASHERS

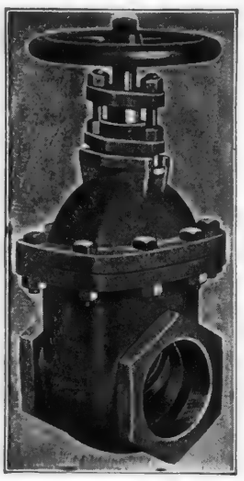


UNIT HEATERS



HEATING — VENTILATING — AIR CONDITIONING — PROCESS DRYING — MECHANICAL DRAFT — EXHAUST

IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings
Brass Valves and Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Another Paracoil Product..

THE **SUBMERGED**
PARACOIL
Storage Water
HEATER

A small, complete water heating unit that economically applies to the 1 to 10 family job the same "below water line" installation principle that has made the large type Paracoil Storage Water Heaters the standard in many of the world's largest buildings.

Write for Bulletin

DAVIS ENGINEERING CORP.
90 West Street New York City

Paracoil
WATER HEATERS

COMPLETE

Swartwout offers a complete line of efficient steam products. Ask for complete catalog.

THE SWARTWOUT CO.
18511 Euclid Avenue
Cleveland, Ohio

Swartwout
Steam Products

ACHIEVEMENT

TYPICAL OF THE AMERICAN TREND IS THE NEW YORK CENTRAL PASSENGER STATION AT BUFFALO. MATCHING THE QUALITY OF BEAUTY IN ITS IMPOSING PROPORTIONS IS THE QUALITY OF DEPENDABILITY TO BE FOUND IN THE EQUIPMENT . . . . . IT IS OF COURSE

100 PER CENT EQUIPPED

WITH

PRESSURE REDUCING VALVES

BY

KIELEY AND MUELLER

INCORPORATED

MANUFACTURERS OF

STEAM—WATER—AIR SPECIALTIES

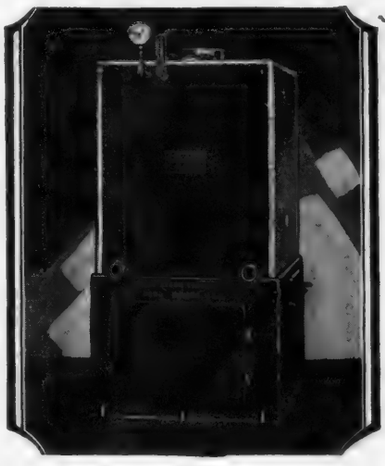
FOR

HEATING—PLUMBING—POWER INSTALLATIONS

THIRTY-FOUR WEST THIRTEENTH STREET

NEW YORK CITY

EVEN HEAT / *EVERYWHERE All the Time!*



FOR Health, and for Comfort, it is necessary that your house be heated evenly throughout and a certain temperature maintained. The Bryan Boiler does this job efficiently. The theory of Bryan Boiler construction is surprisingly simple, yet, it incorporates all of the qualities which are essential to economical and satisfactory house heating with Oil Burners.

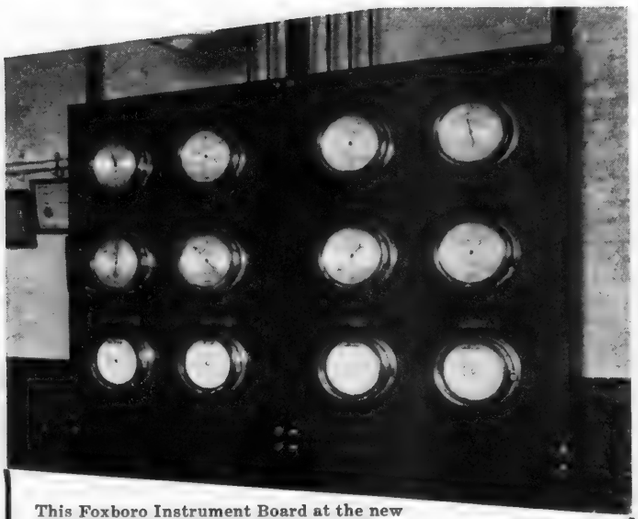
Bryan dealers are finding it very easy and very profitable to sell Bryan Oil Burning boilers. Every Oil Burner user is a good live prospect.

BRYAN

STEAM CORPORATION

BOILER DIVISION

PERU, INDIANA U.S.A.



This Foxboro Instrument Board at the new John Hancock Building, Boston, provides facts on conditions from the boiler pressure to the kitchen steam pressure.

Get more Heat Units from your Pile of Coal

A new heating season is starting. You have a new pile of coal to work on. Will you get more or less heat from it than you did last year? Start off equipped to operate your heating and ventilating plant more efficiently. See how many additional heat units you can get from your pile of coal.

Foxboro Instruments in the largest public and private heating plants are supplying chief engineers with accurate information about pressures and temperatures that greatly increase their ability to regulate heating conditions. Boiler pressures, feed water temperatures, drafts, and boiler water levels are but a few important things that must be absolutely known for economical operation.

For this information you can depend on Foxboro. Get in touch with the nearest Foxboro Branch Office. Recommendations by an experienced Foxboro Engineer involve no obligation.

The Foxboro Guarantee, sealed to each Recording and Controlling Instrument.

THE FOXBORO COMPANY

Neponset Ave., Foxboro, Mass., U. S. A.

New York	Chicago	Philadelphia	Boston
Pittsburgh	Detroit	Cleveland	Tulsa
Rochester, N. Y.	Atlanta	San Francisco	Dallas
Los Angeles		Portland, Ore.	Salt Lake City

AUSTRALIA—Alfred Snashall, Ltd., Sydney and Melbourne

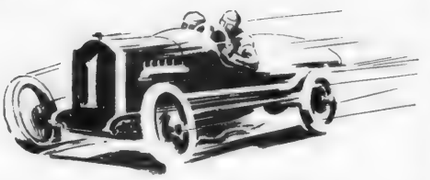
FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure.

High Pressure Burnham Boilers

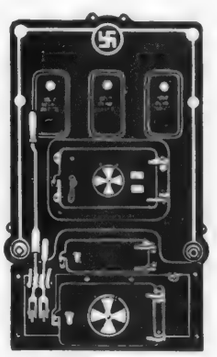


Meet The Speed Test In Hot Water Supply

What's your speed limit? 40, 100, 400, 700 gallons an hour? Burnhams exceed the water speed limit.

But they certainly keep well down below the fuel limit.

That's what you want isn't it?



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Pressure *and* Temperature

2 *in* 1

"Master Control" Valve

(PATENTED)

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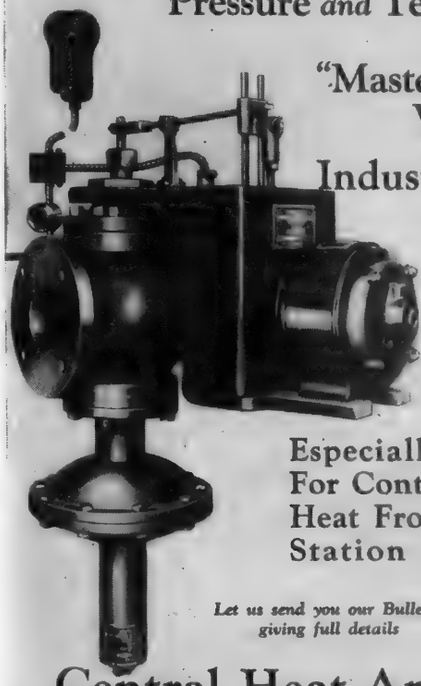

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All Relays Eliminated ... ...

Especially Designed For Control of Steam Heat From a Central Station

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The One Insert Suitable for Any Hanger

E-Z Insert is adaptable to all sizes of pipe hangers, whether supported by pipe, bolt, rod or band iron.

Adjustable—allowing for expansion and alignment of inserts. Ball and socket arrangement between insert and hanger. No coupling or turn buckles needed—the E-Z button turns in the insert.

"7 in 1" Made in one size and that one size will accommodate ¼ in., ⅜ in., ½ in. and ¾ in. rod, and ¼ in., ⅜ in. and ½ in. pipe. Seven in one. Efficient—Economical.

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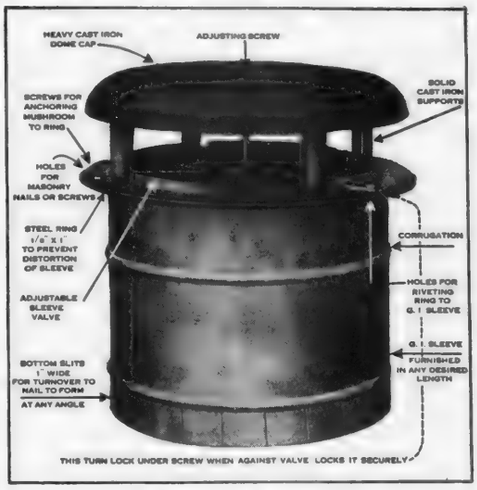
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By Writing

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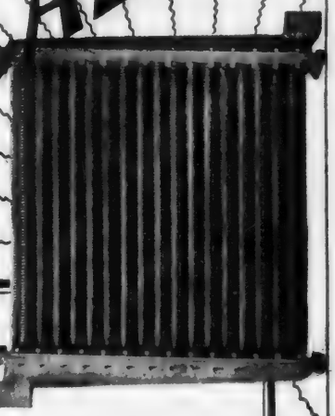

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Engineering specifications that insure trouble-free service

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Many other features.

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Good Radiators since 1905.

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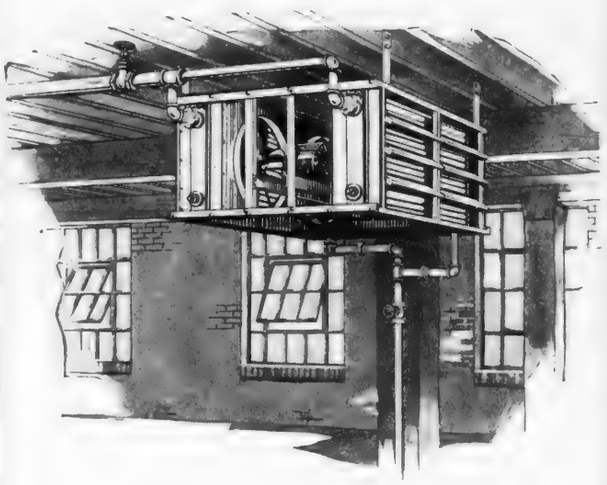

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Wherever there are spaces to be heated in either large or small rooms of any description, some of the various types and sizes of Twinfan Heaters will give supreme satisfaction.

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Wainwright heaters, built in vertical and horizontal types, are installed in leading hotels, apartments, hospitals and public buildings. List of installations upon request.

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A combined heater and humidifier. It is easy to install in new or old houses. Nothing shows but the grille, yet every part is accessible. The simplest method of concealing the radiator in first floor rooms and at the same time supply automatically the right amount of moisture for the entire house.

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. . . "my friend Jones *sold me* the Newport Magazine-feed Boiler. *And he knew his heaters, too.* Now I'm paying *half* what my neighbors pay for coal."

This is a typical expression from an average Newport owner. The economical, convenient heating which inspires such praise is endorsed by practical architects and veteran heating men in every building center.

Dependable magazine fuel feeding—savings up to $7 per ton on fuels — adaptability — even and plentiful heating—these are some of the major Newport features which make Newport Boilers easily "sell-able" as the most convenient, most modern and cheapest method of heating.

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THIS diagram shows the unique magazine-feed principle of the Newport Boiler. You fill the magazine never more than once a day . . . usually two or three times a week, as the weather requires. As the fuel burns away at the bottom gravity feeds more coal from above. An even fire-bed is maintained.

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Airmaster moves more air with less effort because the air thrust is practically equally distributed. Airmaster's shorter blades have less vibrating resonance; its design reduces air friction and resistance. Result: larger air capacity, less power consumption, silent operation. What more could you want of any ventilating fan? Ask for details.

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is of paramount importance in considering the installation of a ventilating system. Easily adjustable to provide close regulation of air, TURTLEBACKS are highly advantageous for the theatre, school and auditorium. A free flow of air plus ease of installation plus the unusual strength and economy make this model the proven leader in its field.

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The most accurate, constant and durable of expansion units

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Positive and Dependable Thermostatic Metals

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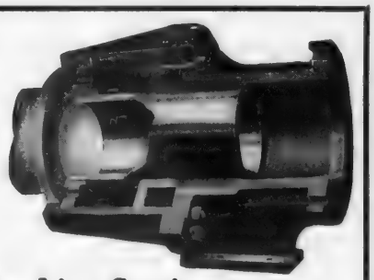

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Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

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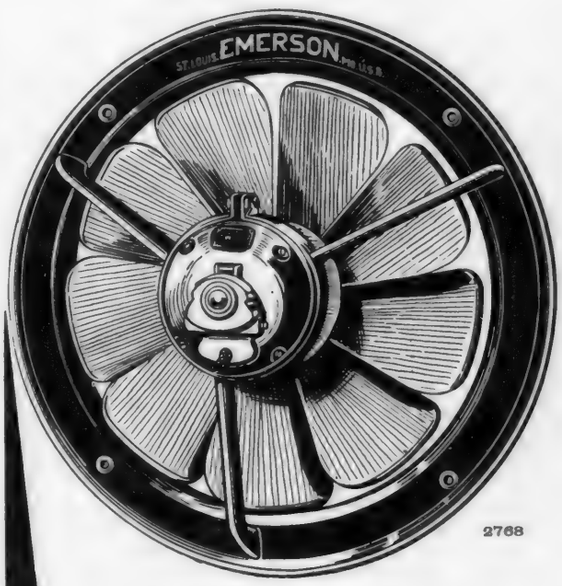

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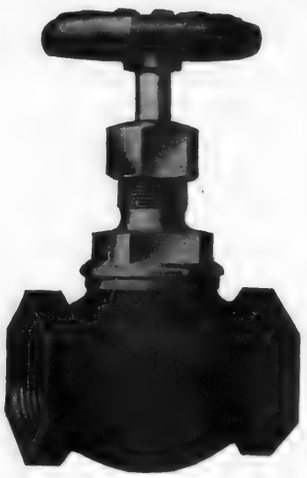

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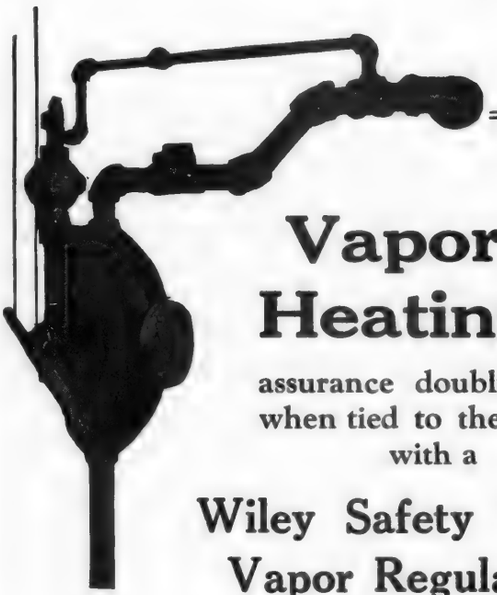

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assurance doubly sure when tied to the boiler with a

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The bulb fittings are interchangeable. This instrument is easily converted to a rigid stem thermometer, straight or angle form, and with any kind of connection.

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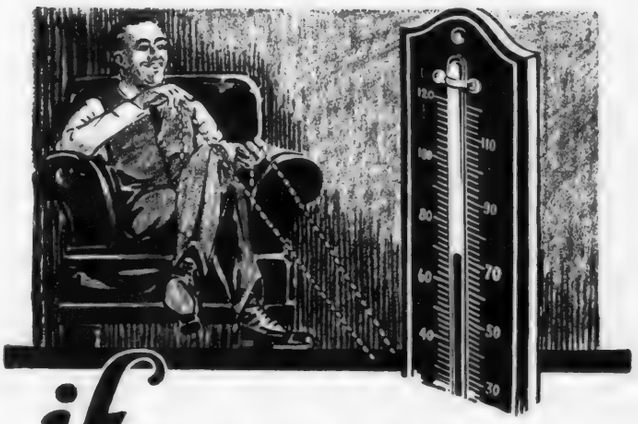

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METAPHRAM DAMPER REGULATORS remove the need for manual control of draft and check dampers.

With extreme sensitivity to slight changes in pressure or temperature, they develop sufficient power to *gradually* move dampers and maintain uniformity in the heating system.

METAPHRAM DAMPER REGULATORS fit *all* domestic heating boilers. They are a profitable item for replacement of less satisfactory devices.

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☐ Bulletin F-100—Type F Metaphram Damper Regulator for hot water boilers.
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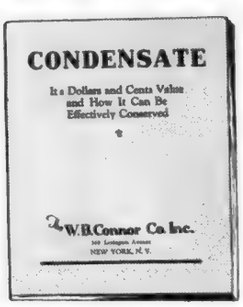
Literature on request. Write concerning your specific problem.

BIG SAVINGS

through the proper handling of condensate

By proper draining and conservation of condensate, fuel bills can be substantially reduced and efficiency of steam-using apparatus materially increased. Just how large these savings are, is frequently not appreciated. Realizing this, we have prepared a 40-page manual covering the whole subject in terms which the non-technical man can understand. It is fully illustrated and printed in large type for easy reading. It tells how condensate can be effectively drained and conserved. It explains the different classes of steam traps, their construction, operation and conditions for which each class is suited.



Heating Engineers, Plant Engineers and Executives of steam-using plants will find it worth while to read this manual. A copy will be sent free to any individual or company requesting it on the business letterhead of the organization. The edition is limited.

Write for your copy—today.

***The* W. B. Connor Co., Inc.**
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Manufacturers of CONNOR Steam Traps—*Non-Return and Pumping Types for All Condensate Handling Requirements*

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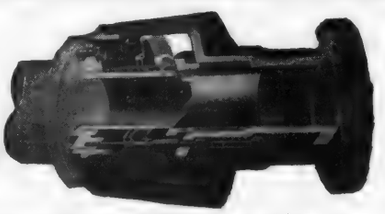
Crosshead-GUIDED Expansion Joint Excels in



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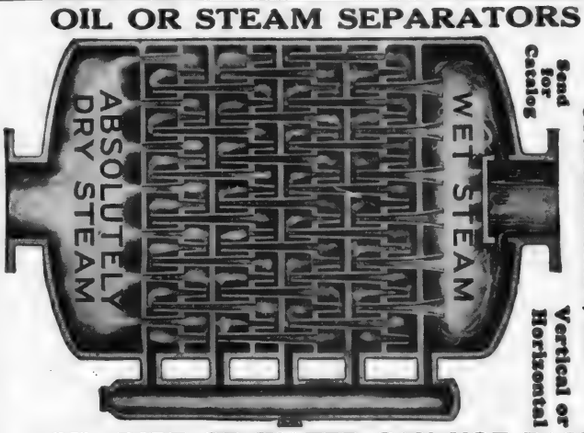

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for Air-Heating and Air-Cooling Units

½" to 6". Lengths up to 15 ft.

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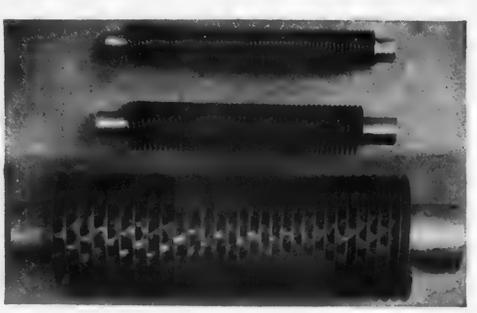

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destructive to property and dangerous to life, are handled in acid-proof Duriron fans as safely as pure air is in fans of other materials.

Duriron fans exhaust efficiently fumes from chemical laboratories and corrosive processes in any volume up to 5000 cubic feet per minute.

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Vilter

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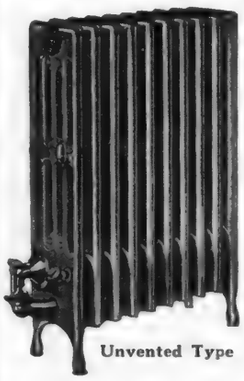
Milwaukee, Wis.

For an authoritative solution of your refrigeration problems consult our Engineering Department.

26-29

SINCE 1867



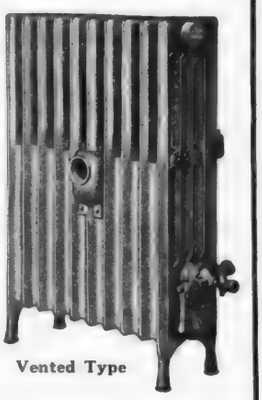
Unvented Type

Pittsburgh Automatic Gas Steam Radiators

There is no heating apparatus on the market today that equals the Automatic Gas Steam Radiator in convenience and comfort. They afford steam heat, which is universally known as the best means of heating. They are automatically controlled. There is no boiler, no dirt, no labor, and heat when and where you want it by simply striking a match.

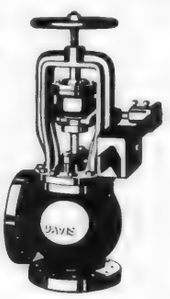
The flue type Automatic Gas Steam Radiator is intended to aid in ventilating by taking air from the floor through the radiator into a chimney or flue outlet. This is in a manner forced ventilation.

AUTOMATIC GAS STEAM RADIATOR CO.
301 BRUSHTON AVENUE, PITTSBURGH, PENNSYLVANIA



Vented Type

DEPENDABLE AT THE CRITICAL MOMENT



Like a fuse in an important electrical circuit, a Davis Stop and Check Valve acts positively the instant it's needed.

The Davis Stop and Check Valve is protected against scale formation and expansion. These common causes of trouble have no effect on the Davis.

Besides this protection, Davis design gives visible action and a means for hand testing at any time. You never have to guess about its working condition.

Send for catalog No. 11.

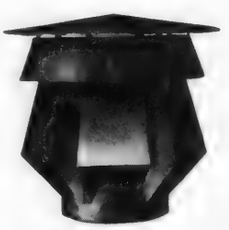
G. M. DAVIS REGULATOR CO.
414 MILWAUKEE AVE. CHICAGO, ILL.

Balanced Valve Float Valve Steam Valve Back Pressure Valve
Pressure Regulator Exhaust Relief Valve Non-Return Valve
Butterfly Valve Float Box with Control Valve

DAVIS AUTOMATIC VALVE SPECIALTIES

H&V 9-Gray

Specify ÆOLUS IMPROVED VENTILATORS



Can be used for ventilating attics, kitchens and bathrooms in homes.

ÆOLUS DICKINSON
Industrial Division of Paul Dickinson, Inc.
3340 S. Artesian Ave.
Chicago, Ill.

180 CRANE BRANCHES AND SALES OFFICES BLANKET THE WORLD

CRANE

BUY YOUR VALVES AND FITTINGS FROM THE CRANE BRANCH NEAR YOU

United States Ozone Company of America

Manufacturers and Engineers
ESTABLISHED 1910

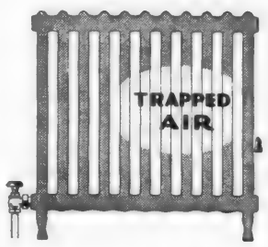
Trade Mark USOZONE Reg. U.S. Pat. Office

Trade Mark USOZONE Reg. U.S. Pat. Office

"United States Ventilating Ozonizers"

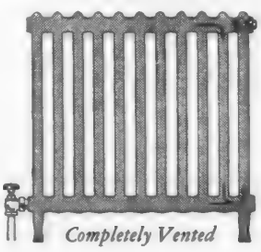
Let us send you our Bulletins Nos. 41 and 54 *Factory and Sales Office,* SCOTTDALE, PENNA.

THIS actually HAPPENS

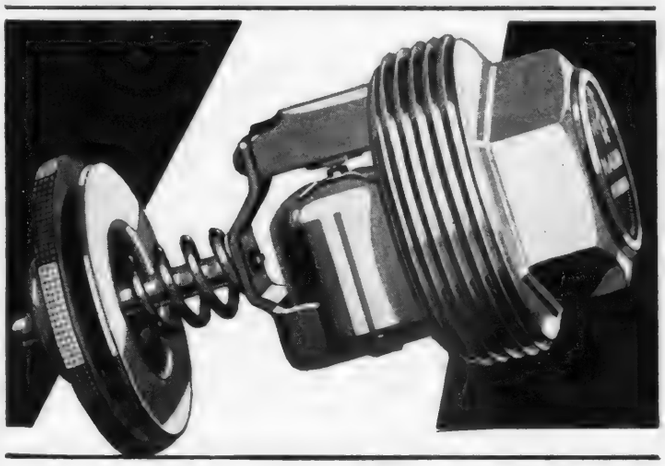


MANY *contractors have experienced this trouble.* When new water radiators are used on a steam job the steam short circuits across the top openings and closes the air valves before all the air has vented. This trapped air greatly reduces the heat output of the radiator—and often to such an extent that additional sections are necessary.

IN-AIRID is not "just another air valve"—it is the one successful solution to this problem. The IN-AIRID fits into the top plug on the vent end section of the radiator and completely blocks off the opening into the last section. Thus the steam is forced to travel down the next to the last section and up the last, driving all the air ahead, before it comes in contact with the valve and closes it.


Completely Vented

IN-AIRIDS located within the radiator cannot be tampered with. Their invisibility also adds to the appearance of the radiator.



In-Airid No. 1 for Steam *In-Airid No. 2 for Vacuum*

Airid Air Valves No. 500 and Vac-Airids No. 510 for old-style steam radiators.

AMERICAN RADIATOR COMPANY

Makers of a complete line of Valves, Vents and Regulators

The Electric Furnace-Man

(Patented Automatic Coal Burner)

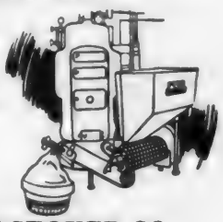
Safeguards the home with UNIFORM—CLEAN—DEPENDABLE HEAT

THE ELECTRIC FURNACE-MAN insures protection, barring out fire-hazard, minimizing winter colds and other ailments, and further aiding health by providing UNIFORM HEAT—without smoke, smudge, dust or irritating odors.

This MODERN scientific achievement is a mechanical device which uses the economical Buckwheat or Rice sizes of ANTHRACITE. Brought to a high state of perfection—time-tested and proved in thousands of installations—this device is revolutionizing home-heating practice. It is giving home owners a new conception of AUTOMATIC HEATING EFFICIENCY—with absolute SAFETY.

The ELECTRIC FURNACE-MAN is available for the modest home as well as the mansion. For every heating system — warm air, steam, vapor or hot water. EXCELLENT FOR HOT WATER SUPPLY.

Labor-saving—no grates to shake—no drafts to regulate. Here is AUTOMATIC HEAT without hazard. Easily installed in a few hours and at a very reasonable cost.



Patented product of DOMESTIC STOKER CO.

Domestic Stoker Co., 7 Dey Street, New York
I would like to hear more about this interesting system and have you arrange to show me one or more local installations.

Name.....

Address.....

.....

ENGINEERS' SPECIFICATION INDEX

ACID FUME EXHAUSTERS
Duriron Company, Inc., The, Dayton, O.

AIR COMPRESSORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS
Air Filtration Co., New York.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
U. S. Ozone Corp., Scottdale, Penn.
Vilter Mfg. Co., Milwaukee, Wis.
Woodward Co., Frank E., Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

AIR COOLING & DRYING SYSTEMS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.

AIR ELIMINATORS
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERS
Air Filtration Co., New York.
American Blower Co., Detroit, Mich.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
Staynew Filter Corp., Rochester, N. Y.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., Cleveland, Ohio.

AIR WASHERS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BOILERS, COPPER
Badger & Sons Co., E. B., Boston, Mass.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BOILERS, HEATING, CAST-IRON, COAL BURNING
American Radiator Co., New York.
Burnham Boiler Corp., Irvington, N. Y.
Combination Boiler Co., Benton Harbor, Mich.
Illinois Malleable Iron Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Weil-McLain Co., Chicago, Ill.

BOILERS, HEATING, DOWN-DRAFT, COAL BURNING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
International Boiler Works, East Stroudsburg, Pa.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Oil City Boiler Wks., Oil City, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

BOILERS, HEATING, GAS-FIRED
American Gas Products Corp., New York
American Radiator Co., Buffalo, N. Y.
International Boiler Works, E. Stroudsburg, Pa.
Frost Mfg. Co., Galesburg, Ill.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, MAGAZINE FEED
Gorton Heating Corporation, New York.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower Co., Reading, Pa.

BOILERS, HEATING, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
International Boiler Works, E. Stroudsburg, Pa.
Johnston Bros., Inc., Ferrysburg, Mich.
Monitor Boiler Co., Philadelphia, Pa.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, STEEL, COAL-FIRED
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Coatesville, Pa.
Combination Boiler Co., Benton Harbor, Mich.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joliet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Oil City Boiler Wks., Oil City, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, POWER
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Oil City Boiler Wks., Oil City, Pa.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.
Rochester Circulator Mfg. Co., Rochester, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDUITS, UNDERGROUND PIPE
American District Steam Co., North Tonawanda, N. Y.
Ric-wiL Co., The, Cleveland, Ohio.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Foster Wheeler Corp., New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Ric-wiL Co., The, Cleveland, Ohio.

DAMPER REGULATORS
(See Regulators, Damper).

DAMPERS, DUCT
National Regulator Co., Chicago, Ill.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

DISTILLERS (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES, MECHANICAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

ENGINES, STEAM
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

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Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

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Aeolus Dickinson, Chicago, Ill.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

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Phillips Drill Co., Chicago, Ill.

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International Heating & Ventilating Exposition, Philadelphia, Pa.

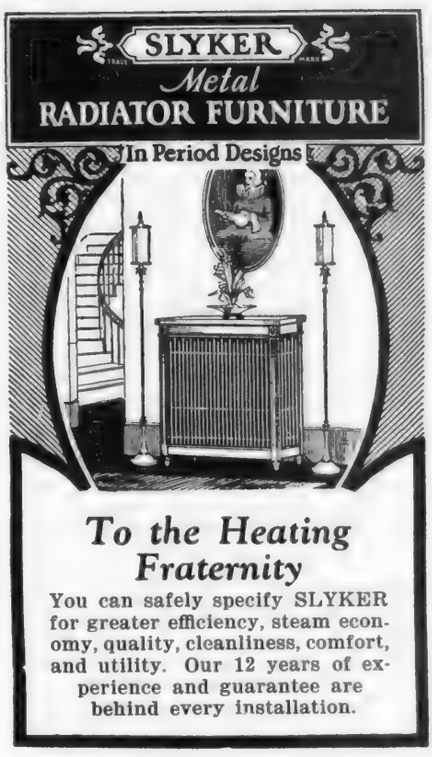
FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, DISC
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, PROPELLER
Airmaster Corp., Chicago, Ill.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

SLYKER

You don't need more radiation with *this* enclosure



To the Heating Fraternity

You can safely specify SLYKER for greater efficiency, steam economy, quality, cleanliness, comfort, and utility. Our 12 years of experience and guarantee are behind every installation.

This type Slyker Metal Enclosure increases the efficiency of the radiator on which it is used. It also makes for more healthful conditions by adding humidity which allows greater comfort at a lower breathing level temperature.

From a report entitled, "Investigation of Steam Radiators with Enclosures and Shields by A. C. Willard, A. P. Kratz, M. K. Fahnestock and S. Konzo, all of the University of Illinois" appearing in the February, 1929, issue of HEATING AND VENTILATING, we quote the following:

"Since the degree of comfort produced is probably the final criterion for judging the performance of any given heating unit, the mean temperature in the zone from the floor to the breathing level is the most important factor involved. The highest mean temperature below the breathing level was obtained with Enclosure No. 3."

TABLE 3*—COMPARISON OF PERFORMANCE FACTORS FOR ENCLOSURES

Enclosure No.	Type Fig. No.	Performance Fig. No.	Temperature at Breating Level deg. F.	Difference in Temperature Ceiling-Floor deg. F.	Mean Temperature below Breathing Level deg. F.	Net Steam Condensed lb. per hr.
Unenclosed	9	23-28	69.4	21.8	62.0	5.44
2	11	23	70.5	22.4	62.7	4.89
3	**12**	**24**	**69.5**	**18.2**	**63.6**	**4.71**
5	14	28	69.1	18.9	62.7	4.68
8	17	26	69.6	20.5	61.8	4.75
8a	18	26	71.1	21.7	63.6	4.84
9	19	25	69.7	21.7	61.8	4.87
10	20	27	66.2	23.0	57.8	4.50

*This table shows the results of the completed test from the University of Illinois Bulletin No. 192.

Write for complete copy of this report. We will also send you some interesting data on how to beautify radiators and rooms with radiator enclosures which in no way interfere with the efficiency of the heating system.

SCHLEICHER, *Inc.*

Manufacturers of Slyker Metal Radiator Furniture **Factory, Gary, Indiana**

LIST OF SYLKER REPRESENTATIVES (Listed as Schleicher, Inc., and SLYKER Show Rooms)

Radiator Furniture Co.
420 Boylston St.
Boston, Mass.

Slyker Show Rooms
1644 Straus Bldg.
Chicago, Ill.

Sullivan & Hettiger
1211 First Nat'l Bank Bldg.
Cincinnati, Ohio

Slyker Show Rooms
722 Union Trust Bldg.
Cleveland, Ohio

Mr. J. F. McGavock
2744 Lothrop Ave.
Detroit, Mich.

Mr. J. C. Fair
612 Pettigrue St.
Greenville, S. C.

Slyker Show Rooms
1433 Architects Bldg.
101 Park Avenue
New York, N. Y.

American Appliance Co.
1214 Harney Street
Omaha, Nebr.

Mr. E. S. White
4804 N. Broad St.
Philadelphia, Pa.

Slyker Show Rooms, Inc.
716 Empire Bldg.
Pittsburgh, Pa.

Mr. C. Walter Hoover
101-2 Lenox Bldg.
Washington, D. C.

T. Eaton Co., Ltd.
Winnipeg, Canada

Mr. Fred L. Whitney
10 South West Temple St.
Salt Lake City, Utah

Mr. C. H. Albright
Box 287
Davenport, Iowa

Mr. G. A. Wyman
1823 N. Church St.
Rockford, Illinois

Mr. Paul C. Bouvier
77 Dwight St.
Springfield, Mass.

Mr. H. N. Shaw
1373 El Centro Ave.
Oakland, Calif.

Mr. Edward Uhl
806 South Broadway
Los Angeles, Calif.

Le Beau, Inc.
426 Clinton Ave.
Joliet, Illinois

Jorgensen Davis Co.
183 Brewery St.
New Haven, Conn.

Mr. Hugh McGavock
721 St. Lawrence St.
Beloit, Wisc.

The above are listed in the local telephone directory of these cities in the individual's name and also under SLYKER Showrooms.

FANS, MULTI-BLADE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, STEEL PLATE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Walworth Co., New York.
Watts Regulator Co., Lawrence, Mass.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

FITTINGS, PIPE, FLANGED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES
Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
General Gas Light Co., Kalamazoo, Mich.

GAS BURNERS (CONVERSION TYPE)
Columbia Burner Co., Toledo, Ohio.

GASKETS, ASBESTOS
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, METALLIC
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, RUBBER
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.

GAUGES, DRAFT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS
(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Stanwood Corp., Cincinnati, Ohio.
Watts Regulator Co., Lawrence, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Stanwood Corp., Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATERS, UNIT GAS FIRED
General Gas Light Co., Kalamazoo, Mich.
Texo Sales Co., Cincinnati, Ohio.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm., H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Watts Regulator Co., Lawrence, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

(AT RIGHT)
STEUBEN CLUB
K. M. Vitzthum & Co. Inc.
Architects
E. B. Kaiser
Heating Contractors

(AT LEFT)
WILLOUGHBY TOWER
S. N. Crowen & Associates, Inc.
Architects
Kohlbry-Howlett Co.
Heating Contractors

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BRANCHES AND REPRESENTATIVES IN 40 CITIES

CHICAGO

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER
Badger & Sons Co., E. B., Boston, Mass.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Crocker-Wheeler Electric Mfg. Co.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
May Oil Burner Co., Baltimore, Md.
McIlvaine Burner Corp., Chicago, Ill.
Preferred Oil Burners, Inc., Peoria, Ill.
Winslow Boiler & Eng. Co., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.

PIPE HANGERS
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

PIPE, STEEL
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Janette Mfg. Co., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATOR ENCLOSURES AND SHIELDS
American Metal Products Corporation, St. Louis, Mo.
Schleicher Inc., Gary, Ind.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS, CABINET AND CONCEALED
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
U. S. Radiator Corp., Detroit, Mich.

RADIATORS, GAS FIRED
Automatic Gas Steam Radiator, Pittsburgh, Pa.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

STOKERS, MECHANICAL
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
Fire-King Stoker Co., Indianapolis, Ind.
General Stoker Corp., New York.

STRAINERS, OIL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.

7 Major Reasons Why

Electrol maintains its leadership

as the world's largest producer of Quality Oil Burners

1 ELECTROL has the Industry's outstanding man at the head of each department: research, design, patents, manufacturing and merchandising.

2 ELECTROL has been made commercially perfect — the dream of all conscientious burner manufacturers.

3 ELECTROL'S sound engineering has produced a design, distinctive in appearance and having definite sales value.

4 ELECTROL has an unrivaled patent position, insuring the exclusive use of its features of mechanical superiority. The majority of important features of oil burner design used in the industry today are covered by ELECTROL patents.

5 ELECTROL provides both sales and mechanical training courses unmatched in the industry, from which Electrol dealers are provided with productive man power.

6 ELECTROL'S new merchandising plan is especially designed to fit the individual dealer's needs and local conditions. Everything needed to insure the successful carrying out of the plan is provided—from individual copy to telephone saleswomen, trained salesmen and executive help.

7 ELECTROL is unalterable committed to the policy of devoting its major effort to making its dealers prosper.

ELECTROL INCORPORATED

177 Dorcas St. St. Louis, U. S. A.

THERMOMETERS, RECORDING AND INDICATING

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
General Air Filters Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Chadeayne, Geo. D.,
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Watts Regulator Co., Lawrence, Mass.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, VACUUM RELIEF

Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa
Time-O-Stat Controls Co., Elkhart, Ind
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J
General Air Filters Corp., New York.
National Regulator Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill
Skinner Bros. Mfg. Co., St. Louis, Mo
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corporation, St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow Co., Jas. B., Chicago, Ill.

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

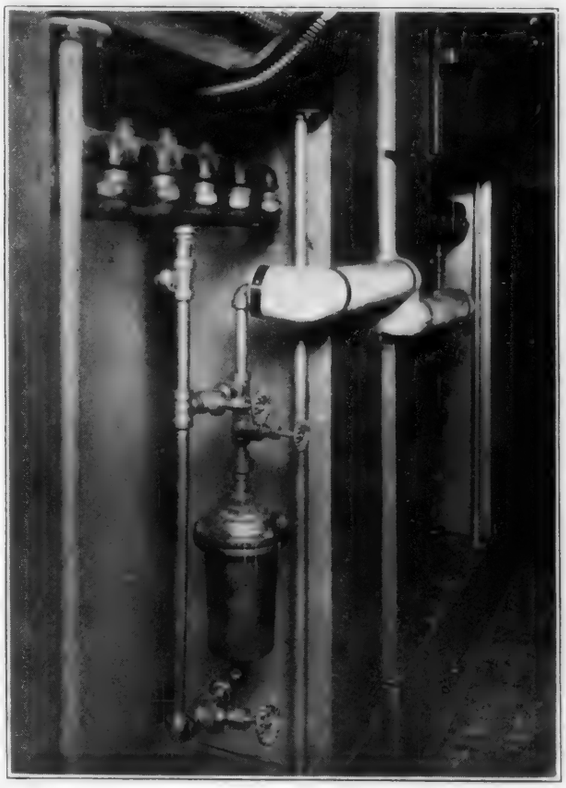
WRENCHES, STILLSON

Walworth Co., New York.

ZONE HEATING SYSTEMS

Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster Talmadge, New York.

Do your unit heaters show up to best advantage ?



No matter how good unit heaters are, they cannot show up to best advantage when handicapped by condensate and entrained air.

The illustration shows two unit heaters in the Pullman Laundry, St. Louis, Mo., that are enabled to "Put the best foot forward" by means of Armstrong Traps. The unique operating principle of these traps permits not only the automatic elimination of condensate as fast as it forms, but the discharge of air, undissolved gases, oil, scum and sediment as well. They are self scrubbing, yet positively water sealed against the escape of live steam.

Note the simplicity of the Armstrong Trap. All the working parts are contained within the trap body. Large capacity is provided, yet it is light and compact enough to be supported by the pipes to which it is connected. Practically no attention is ever required. Made in sizes and types to handle any condensate draining problem.

Other traps used on unit heaters

The Armstrong Trap shown in the large picture is the No. 2. Other types widely used are the Nos. 30 and 31, which have smaller capacities. All types give long, trouble-free service.

Our engineering staff will be glad to make recommendations to fit your case. Write for catalog.

ARMSTRONG "INVERTED BUCKET" STEAM TRAP

Armstrong Machine Works

346 Maple Street, Three Rivers, Michigan

District Representatives in 42 Cities

H&V 9-Gray

ALPHABETICAL INDEX OF ADVERTISEMENTS

A

Aeolus Dickinson 160
Aerofin Corporation 27
Airmaster Corp. 154
Alberger Heater Co.....155
Alexander Bros., Inc.....170
American Blower Co..... 26
American District Steam Co..... 46
American Locomotive Co.....119
American Radiator Co., ...13, 41, 50, 141, 161
Ames Pump Co.....119
Armstrong Cork & Insulation Co..132
Armstrong Machine Works.....169
Athey Co. 135
Atlas Valve Co.....156
Automatic Gas Steam Radiator Co. 160

B

Badger & Sons Co., E. B.....126
Baldor Electric Co.....144
Barnes & Jones..... 23
Bayley Blower Co.....145
Bishop & Babcock Sales Co..... 33
Brownell Co. 8
Bryan Steam Corp.....147
Buffalo Forge Co..... 24
Burnham Boiler Corp.....148

C

Carrier Engineering Corp.....158
Celotex Co. 171
Central Station Steam Co.....156
Century Electric Co..... 51
Chace Valve Co., W. M.....155
Chadeayne, Geo. D.....151
Cleveland Gas Burner & Appliance Co. 134
Coatesville Boiler Works..... 10
Connor, W. B., Co.....158
Consolidated Ashcroft Hancock Co., Inc. 157
Crane Co. 160

D

Davis Engineering Corp.....146
Davis Regulator Co., G. M.....160
De Bothezat Impeller Co., Inc. ...138
Domestic Stoker Co.....161
Dunham Co., C. A..... 30
Duriron Co., The, Inc.....159
Dwyer Equipment Co.....152

E

Electrol, Inc. 167
Emerson Electric Mfg. Co.....155
Excelso Products Corp. 40

F

Farnsworth Co. 158
Fitzgibbons Boiler Co..... 54
Flax-li-num Insulating Co..... 36
Foster Wheeler Corp.....153
Foxboro Co., Inc.....148
Frank Heater & Engineering Co., Inc., O. E. 154
Frost Mfg. Co. 9
Fulton Sylphon Co.....129

G

G. & O. Mfg. Co.....154
General Gas Light Co..... 22
Gorton Heating Corp.....138
Grinnell Co., Inc.....117

H

Hardinge Brothers, Inc..... 38
Hartmann Co., Chas.....153
Hartzell Propeller Co.....128
Healy-Ruff Co. 149
Heggie Simplex Boiler Co..... 56
Hoffman Specialty Co.....Back Cover
Hornung, J. C.....149

I

Illinois Engineering Co.....165
Illinois Malleable Iron Co.....140
Insulite Co. 125

J

Janette Mfg. Co..... 55
Jenkins Bros. 18
Johnston Brothers, Inc.....149

K

Kainer & Company.....141
Kennedy Valve Mfg. Co.....156
Kewanee Boiler Corp..... 3
Kieley & Mueller, Inc.....147
King-Seeley Corp. 127
Knowles Mushroom Ventilator Co..151

L

Lytton Mfg. Co.....142

M

Marsh & Co., Jas. P.....172
Marsh Valve Co.....137
McAlear Mfg. Co..... 49
McDonnell & Miller..... 5
McIlvaine Burner Corp.....138
McQuay Radiator Corp.....2nd Cover
Mercoid Corp., The.....143
Modine Mfg. Co..... 12
Monitor Boiler Co..... 6
Mueller Co. 53

N

Nash Engineering Co.....19, 20, 120
National Air Filter Co.....151
National Pipe Bending Co.....150
National Radiator Corp..... 11
National Regulator Co.....157
National Tube Co..... 52
Nelson Corp., Herman..... 31
Newport Boiler Co.....154
New York Blower Co.....150

O

Orr & Sembower, Inc.....150

P

Pacific Steel Boiler Corp..... 4
Page Boiler Co., Wm. H..... 47
Patterson-Kelley Co. 140
Peerless Unit Ventilation Co..... 16
Penn Electric Switch Co..... 37
Pierce, Butler & Pierce.....28, 29
Powers Regulator Co.....115
Preferred Oil Burners, Inc....44, 45

R

Raymond, F. I.....136
Ric-wiL Co. 130
Rome Brass Radiator Corp.....131
Rome-Turney Radiator Co.....151
Ross Heater & Mfg. Co.....158

S

Sarco Co. 58
Schleicher, Inc. 163
Schutte & Koerting Co.....158
Simplex Heating Specialty Co....156
Skidmore Corp. 142
Skinner Bros. 34
Spang, Chalfant & Co., Inc..... 25
Stanwood Corp. 39
Sterling Engineering Co.....144
Sturtevant Co., B. F.....35, 123
Swartwout Co. 146

T

Texo Sales Co.....139
Thermal Units Co.....14, 15
Thrush & Co., H. A..... 48
Time-O-Stat Controls Co.....133
Trane Co. 139

U

U. S. Ozone Co.....160

V

Ventilating Products Co.....155
Vilter Mfg. Co.....159

W

Walworth Co. 21
Want Ads 124
Watts Regulator Co..... 7
Webster & Co., Warren...Front Cover
Weil-McLain Co. .....3rd Cover
White Mfg. Co.....140
Whitlock Coil Pipe Co.....124
Wing Mfg. Co., L. J..... 32
Winslow Boiler & Eng. Co....42, 43
Wolverine Tube Co.....152
Woodward, Frank E.....153

Y

York Heating and Ventilating Corp. 17
Young Radiator Co.....145

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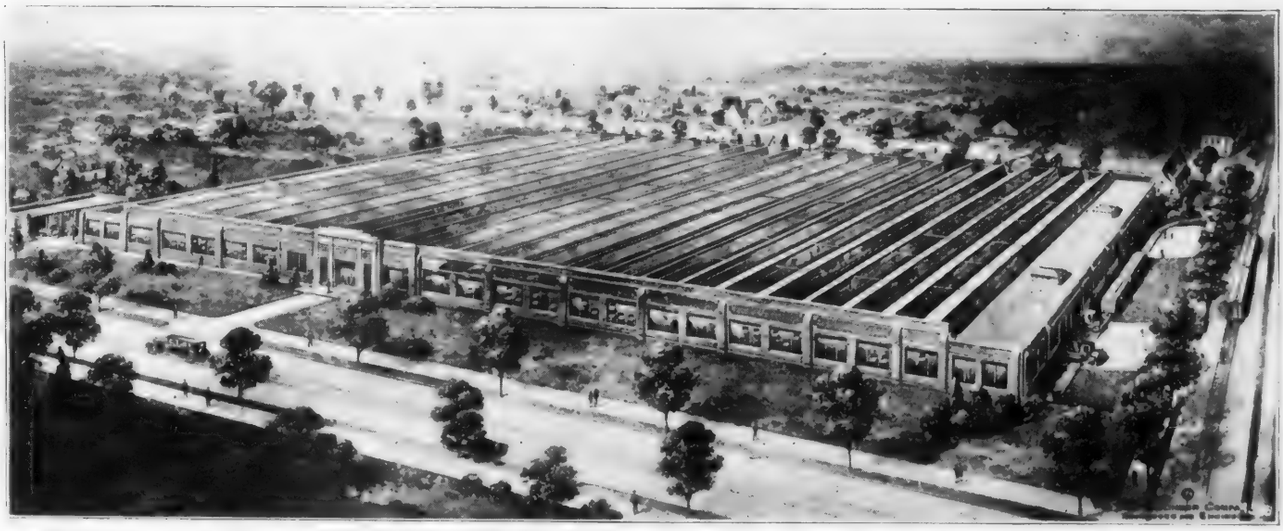

The roof of the Leland Electric Company, Dayton, Ohio, has an area of 83,000 square feet. Here two layers of ½" Celotex Roof Insulation Board or 166,000 square feet were used to eliminate fuel waste and shut out all extremes of temperature. The Ballinger Company, of Philadelphia, Architects and Engineers.

Celotex-Insulated Roofs

reduce fuel waste . . .
prevent ceiling condensation . . .
provide productive working temperatures

IN manufacturing plants roofs insulated with Celotex reduce the loss of heat during the winter and pay big dividends in the saving of fuel. Buildings are adequately heated with less radiation and smaller heating plants.

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Production per labor hour can be kept close to the peak the year 'round. For Celotex shuts out sweltering summer heat and bitter winter cold . . . provides working temperatures that conserve and utilize the nervous and physical energy of employees.

Architects and engineers have specified Celotex Roof Insulation Board for factories of every description . . . have proved its effectiveness time and again. Its low thermal conductivity is a matter of engineering record . . . and the economy of its application cost is always an important consideration.

Celotex Roof Insulation comes in boards measuring 2′ by 5′ with a thickness of approximately ½" or laminated in multiples thereof. These boards are quickly and easily applied to the roofs of new or old buildings . . . over wood, concrete or metal roof decks and under any type of roof covering.

Write us for our folder *Dividends from Proper Roof Protection* containing tabulated data on the actual savings in fuel and radiation obtained with Celotex Roof Insulation Board.

Our own engineers will gladly cooperate with you in solving any particular problem which you care to present.

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64 years ago Jas. P. Marsh & Co. started to design and build heating specialties. And as the advances in heating required better devices Marsh was ready to supply them—*usually from designs originated by Marsh.*

Today, in the Marsh line, there are heating systems and specialties for every installation—large or small. And all have been designed to give *that accurate and positive control* which insures economical heat.

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Heating Contractors: Interstate Plumbing Co., Omaha, Nebraska
Architects: James T. Allan, Noel Wallace

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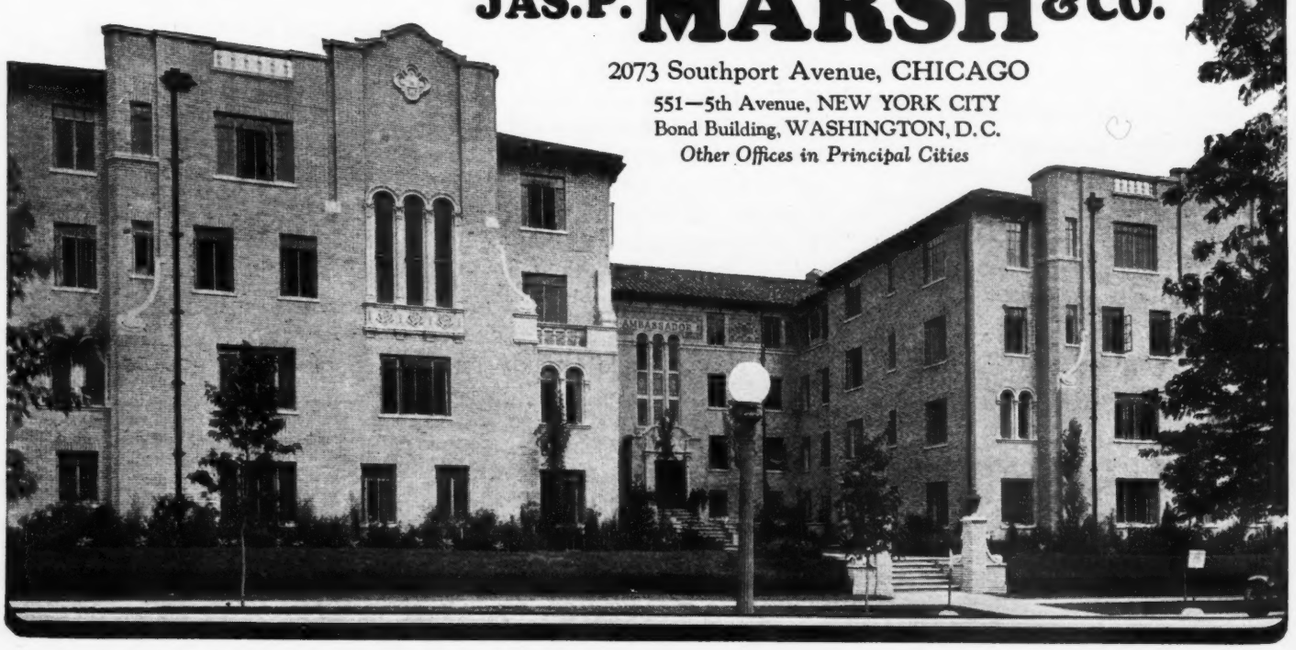

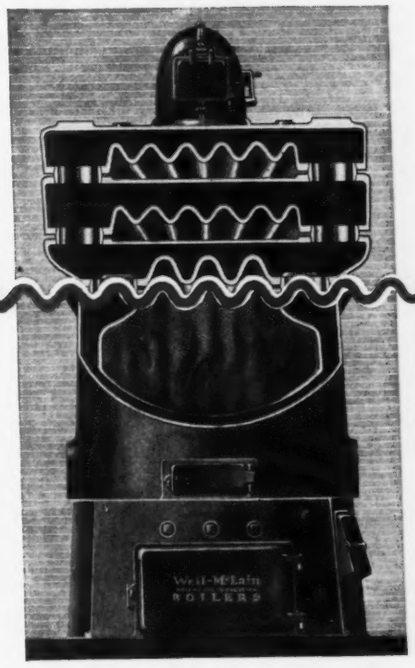

These corrugations

save coal, coke or oil

They add 30% to 40% to the area of heat-absorbing surface

Here is one of the bedrock reasons why the Weil-McLain Round Boiler gives more heat and saves fuel. All the vital heat-absorbing surfaces are corrugated like this ~~~~~ instead of being flat like this ———.

You can easily see the advantage. Just a moment's comparison of the wavy line shown above, with a straight line like this ———, will convince you that the wavy line crowds perhaps one-third more lineal surface into a given space.

In the Weil-McLain Round Boiler this corrugation principle crowds 30% to 40% more heat-absorbing surface into the same space. As a result, this famous boiler is made to yield more heat per ton of coal or coke, or per gallon of oil consumed.

But you will also find other reasons for the success of this Weil-McLain Boiler. For example, it has a long, balanced back-and-forth fire travel. The hot gases are baffled backward and forward through the corrugated heating surfaces. There are no short cuts to the chimney, under *any* condition. A final safeguard against chimney waste!

There are Weil-McLain Boilers to meet all conditions . . . Round Type, Jacketed, Square, Self-feed and Smokeless. Also Weil-McLain Radiators.

They look alike, but *are* they?

Be wise . . . analyze!

The Weil-McLain Line of Boilers has many sales features that remain hidden under casual or indifferent examination. Analyze these features. They will surely help you close jobs—at a profit.

WEIL-McLAIN COMPANY
General Offices: Chicago, Illinois
Boiler Factory:
Michigan City, Indiana
Radiator Factory: Erie, Pa.

Weil-McLain
SCIENTIFIC COMBUSTION
BOILERS

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Want to make some ....*real money* on those "Clean out the Boiler" jobs?

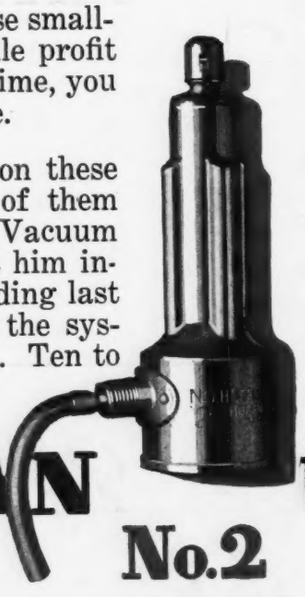
NOW is the time when about everyone in town calls you up to put his heating plant in order for the winter season. Nuisance jobs, but what can you do?

Here's a way to make those small-profit jobs into worthwhile profit producers. At the same time, you sew up customers for life.

When your men go out on these clean-out jobs, let each of them take a Hoffman No. 2 Vacuum Valve in his pocket. Let him inquire of the owner regarding last winter's performance of the system and of each radiator. Ten to one, he'll find out about a cold one on the second floor, and a couple of others that took an hour or so to heat. Twenty to one, he'll find out that all the radiators cooled off in half an hour or so every time steam pressure faded.

Well, that's his opening. Let him tell the short story of Hoffman No. 2 Vacuum Valves. How they make radiators heat up in 15 minutes. How they keep 'em hot *three hours* after drafts are closed or oil flame fades. How they create a partial vacuum. Why water boils quicker in a vacuum. How steam lives longer in a vacuum. How this saves a lot of oil, gas or coal. That's all that's necessary.

Just one thing more. Be sure to have a good stock of Hoffman No. 2 Vacuum Valves on hand when you start this. If the folks in your city are like the folks in some other places, you'll need 'em. Hoffman Specialty Company, Inc., Dept. C-54, Waterbury, Connecticut.



HOFFMAN No. 2 VACUUM VALVES